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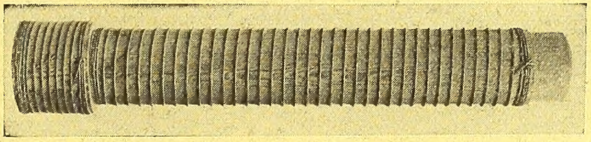
Vol. 37 Toronto, January 3, 1923 No. 1

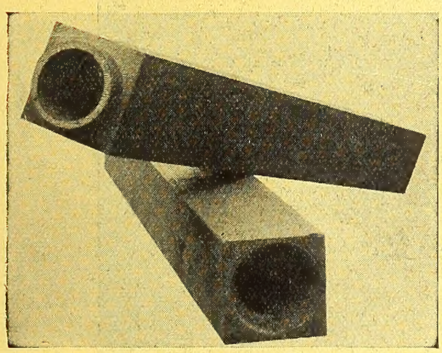
Contract Record and Engineering Review

Wood Stave Pipe

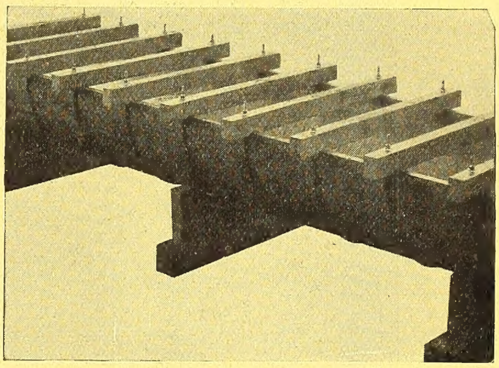
Strength
Flexibility


Wire Wound Wood Stave Pipe

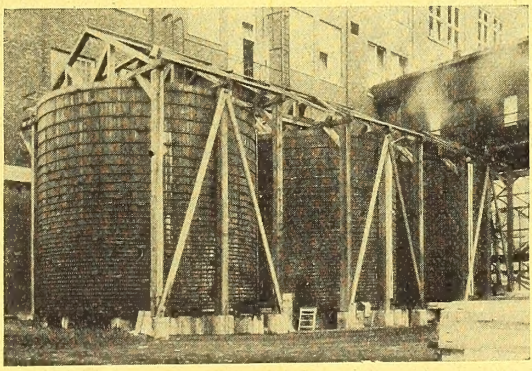
Economy
Durability


Bored Telephone Cable Conduit Pressure Creosoted

Wire Wound
and
Continuous
Wood Stave Pipe
Conduits
Stave Flumes
Wood Tanks
of all descriptions


Continuous Stave Flume

The low first cost of wood stave pipes and the long service they give make them the most economical for Hydro Electric Development and general water supply. Being easy to transport they can be installed in out-lying districts where otherwise the cost would be prohibitive.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All our wood stave pipes, tanks, etc., are made from the world-famous B. C. or Douglas Fir. Write us for full information and if you have any problems consult us. Our advice and experience are always available to engineers and others. Our specialty, complete construction.

Established nearly twenty years.

Pacific Coast Pipe Co., Limited
1551 Granville Street - - Vancouver, B. C.

Alphabetical Index to Advertisers Page 16 Classified Directory to Advertisements Page 6

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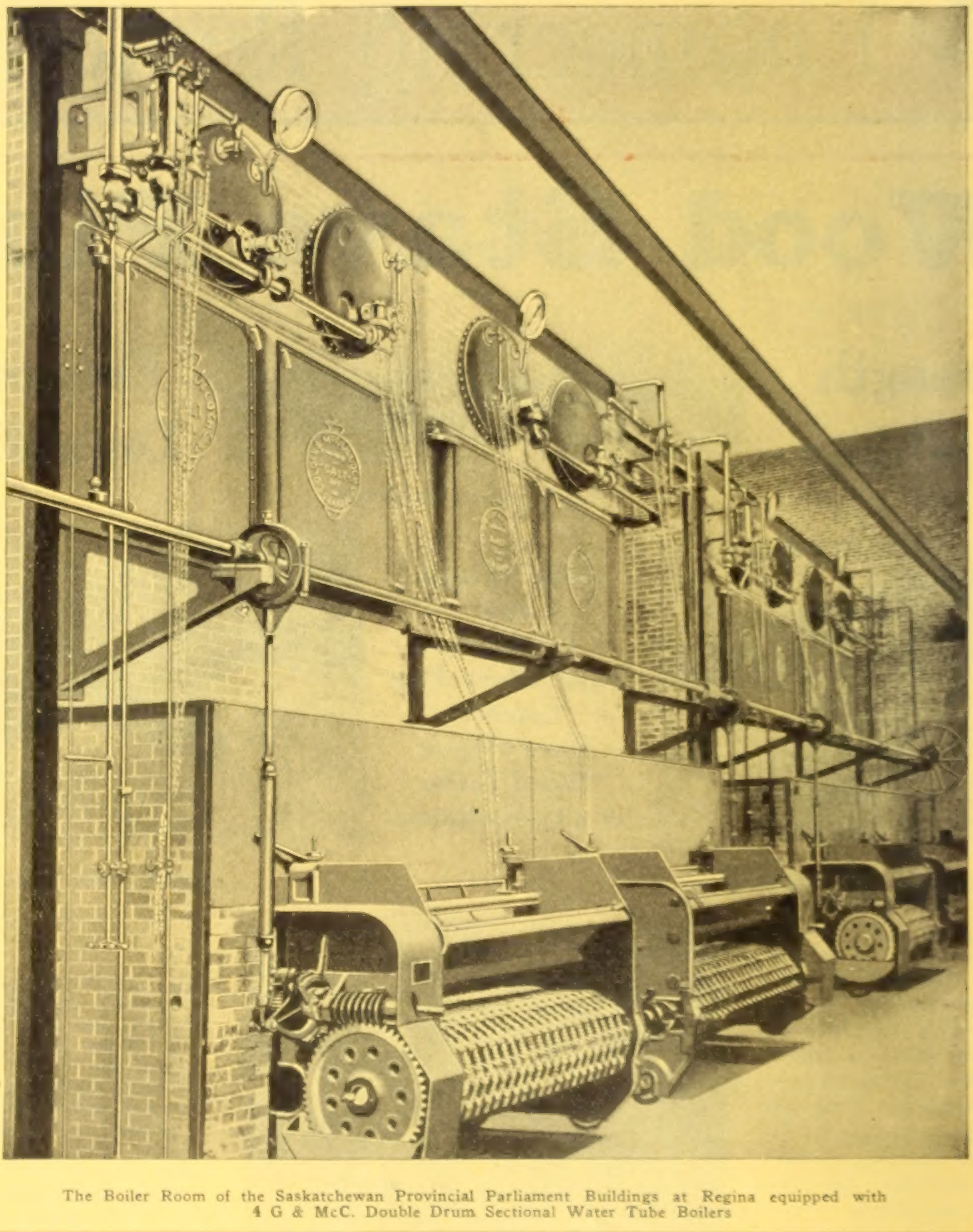
Are to be found in Canada's Leading Power Plants



The Boiler Room of the Saskatchewan Provincial Parliament Buildings at Regina equipped with 4 G & McC. Double Drum Sectional Water Tube Boilers

G. & McC. Boilers will give you increased steaming capacity, more rapid circulation and the maximum overload allowance. Ask for New Catalogue No. 40, Prices, etc.

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412 ST. JAMES ST.,
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ROBT. HAMILTON & CO.,
VANCOUVER, B.C.

LONDON CONCRETE MIXERS

are made in sizes and types to meet every requirement of the building and construction industry.

LONDON GEM NO. 5 WITH 3 H.P. NOVO ENGINE

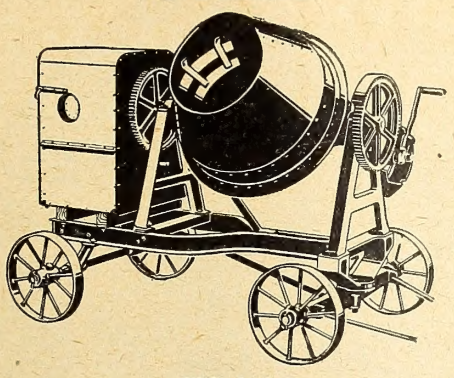

FIG. 814

Fig. 814 illustrates the **London Gem Concrete Mixer** which is made in two sizes,—No. 3 and No. 5, suitable for building foundations, curbs, gutters or any kind of work not requiring over 50 cu. yards per day. Can be loaded on one side and discharged on the opposite side by tilting the drum. A very desirable type of machine for small jobs. Described in Bulletin A-3.

Fig. 25 illustrates the **London Combination Mixers,**—No. 4 and No. 6. Two machines in one. A Concrete Mixer with a real hoisting drum attached. The Hoist and Mixer can be used together or separately. The Concrete Mixer is of a size suitable for all kinds of concrete work requiring a capacity under 60 cu. yards per day. The Hoisting Drum can be used for any kind of hoisting or pulling. If used to operate a Single Cage Elevator it will handle the full output of Mixer. If used to pull a Scraper for excavating it will save two teams of horses and do more work. This is the most popular machine we manufacture. Sold either with or without Hoisting Drum. Described in Bulletin 49-D-1.

LONDON COMBINATION MIXER NO. 4 & 6

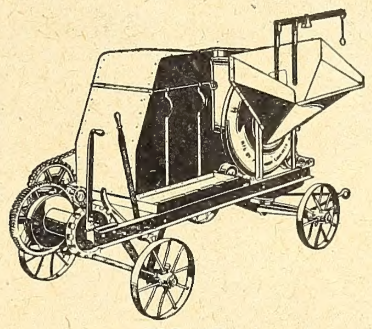

FIG. 25

LONDON HEAVY DUTY CONCRETE MIXER

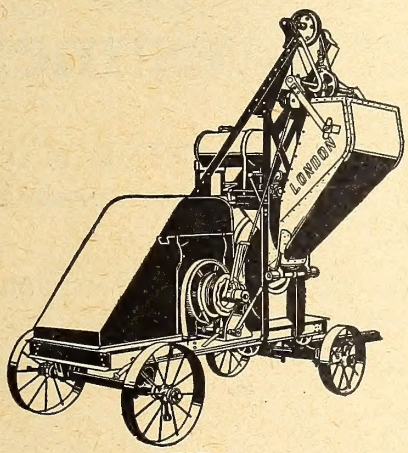

FIG. 33

Fig. 33 illustrates the **London Heavy Duty Concrete Mixers.** Made in five sizes. They can be equipped with Steam, Gasoline or Electric power. Built to stand long and hard service. Designed for rapid mixing and quick discharge. Just the type of machine required for the large contract. Hundreds of contractors testify as to the satisfaction they are giving. Described in Bulletin 49-D-E.

Made in Canada

We manufacture Concrete Mixers, Hoists, Air Compressors, Pumps, Brick, Block and Tile Machines, Barrows, Carts, Silo Moulds, Ornamental Moulds and Tools.

The London Concrete Machinery Co., Limited

Dept. 7 London, Canada

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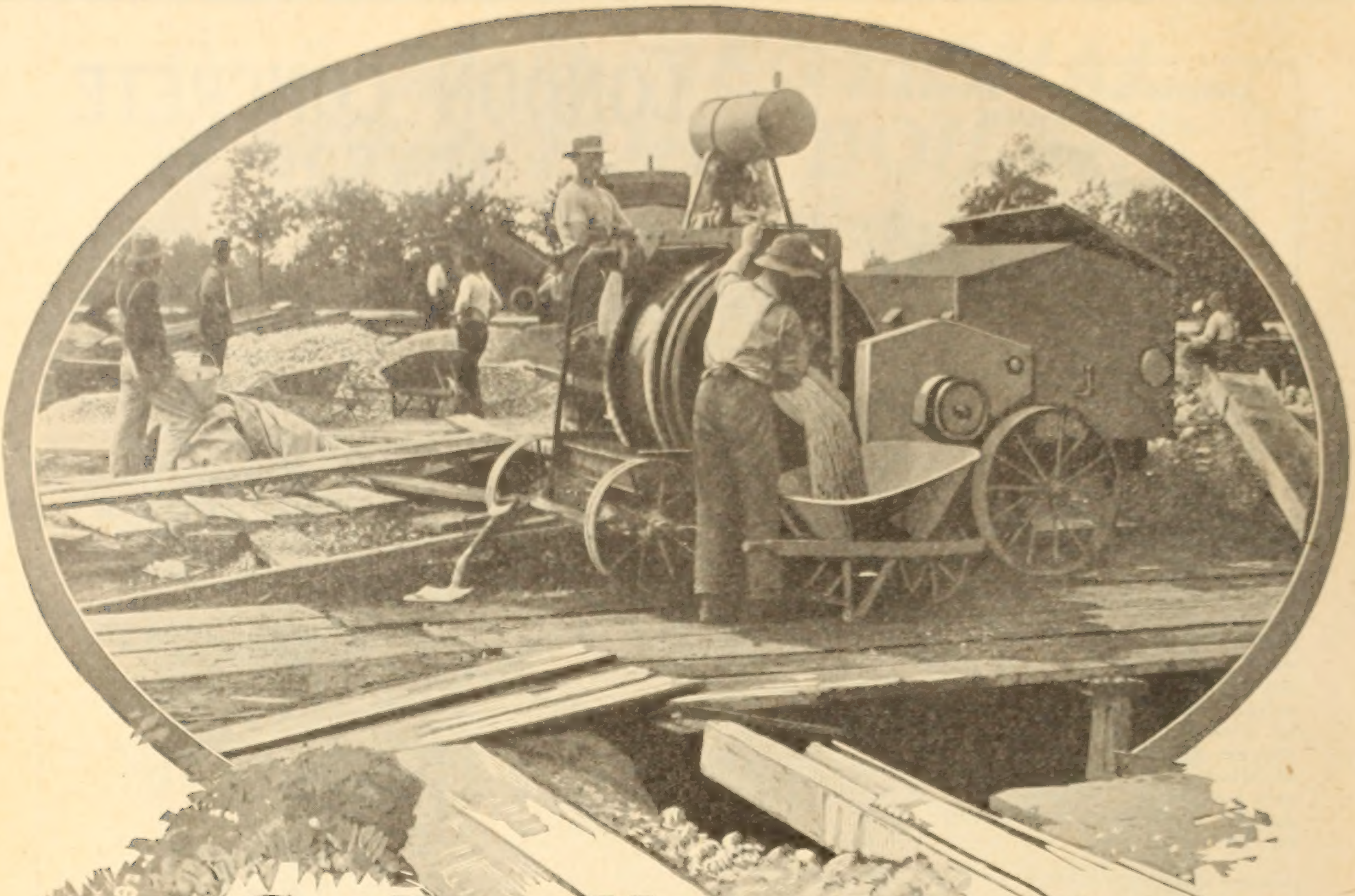

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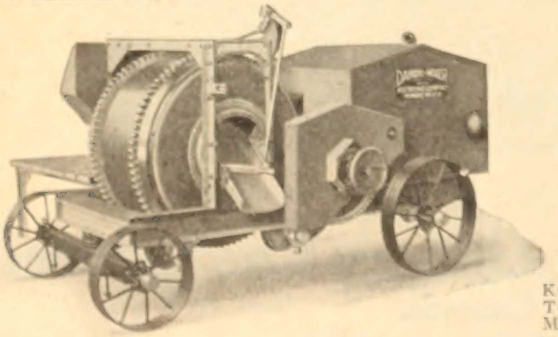
KOEHRING DANDIE CAPACITIES

4 and 7 cubic feet mixed concrete. Steam and Gasoline. Power charging skip or low charging platform — automatic water-measuring tank. Discharge control from both sides. May be equipped with light duty hoist. Mixes mortar as well as uniform concrete.

NO, not the cheapest mixer! Yet the DANDIE is within the price range for light mixers. It is the *remarkable value* in the light mixer field.

Koehring safety-margin construction puts trouble-free, dependable, profitable service in the light DANDIE; fortifies you against costly delays and repairs. Big production and standardization of every part keeps the price down.



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KOEHRING COMPANY OF CANADA LIMITED
105 FRONT ST., EAST. TORONTO. ONTARIO.

Please send me Dandie Catalog D.

NAME

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CITY

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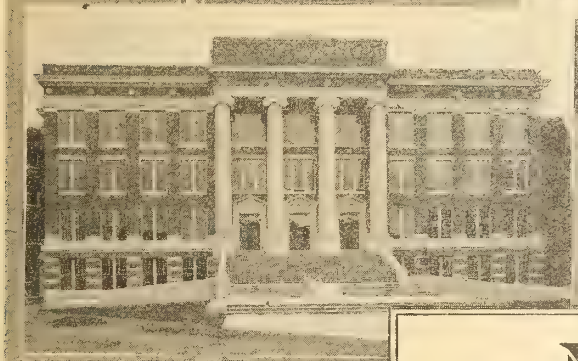

Technical School, Hamilton
Witton & Walsh, Architects
W. E. Wood Construction Co., Ltd., Contractors

Above shows type of
Natco Hollow Tile
Construction used in
these school buildings

NATCO HOLLOW TILE

FOR ECONOMY AND ENDURANCE

Walls of Natco Hollow Tile afford perfect insulation and are substantial, saving the cost of erection. The large unit lay up more quickly and require less mortar than other types of masonry construction.

Natco Hollow Tile is adaptable to any form of architectural treatment—with exterior stucco finish or a facing of brick.

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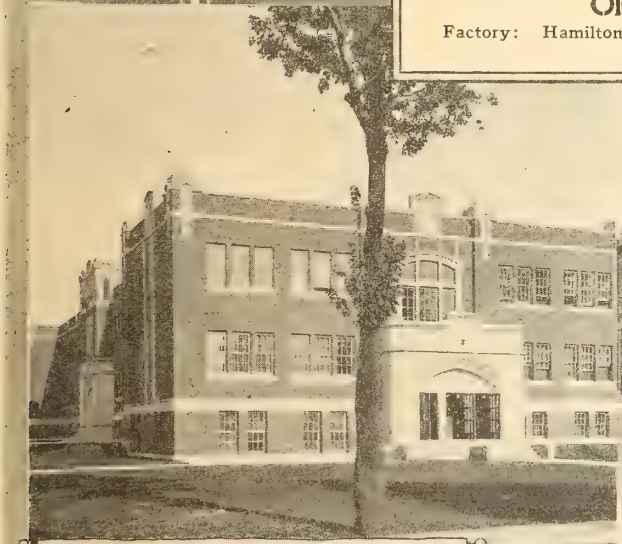

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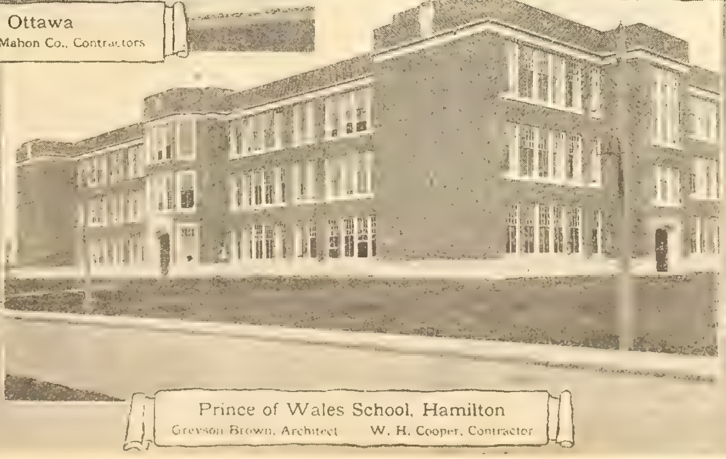
W. C. Beattie, Architect Bate - McMahon Co., Contractors

Danforth Park Public School, Toronto
S. B. Coon & Son, Architects N. McLeod, Ltd., Contractors



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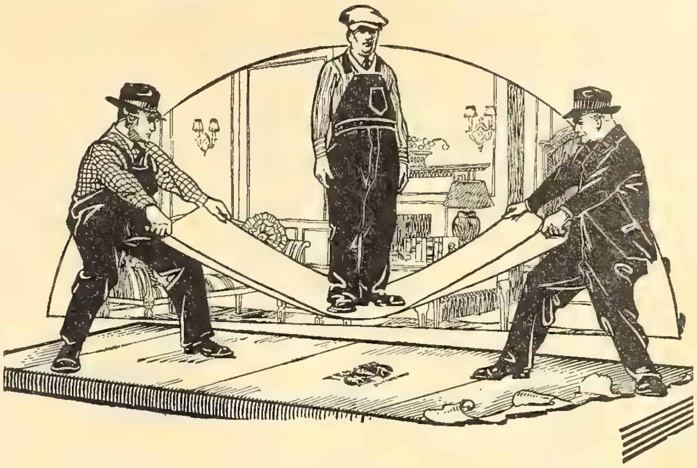

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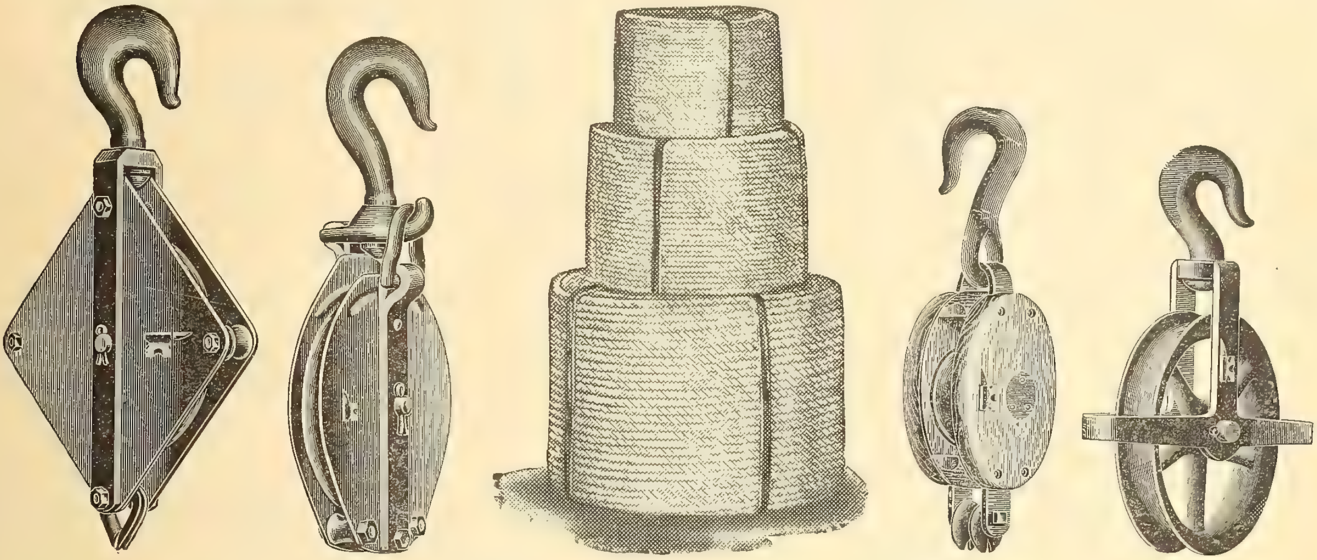

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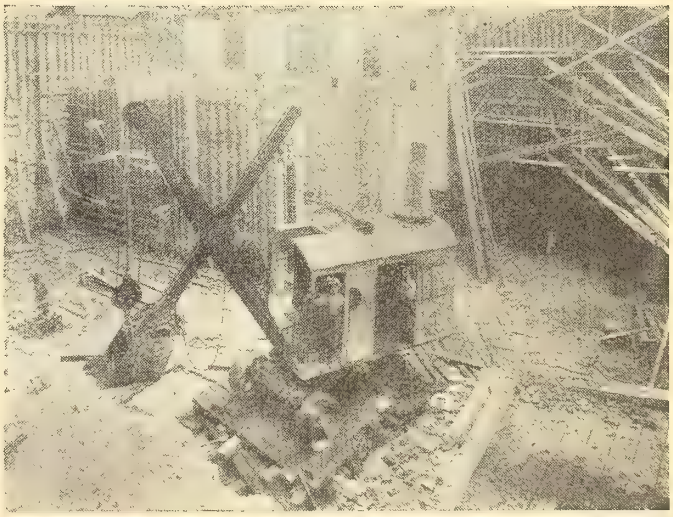

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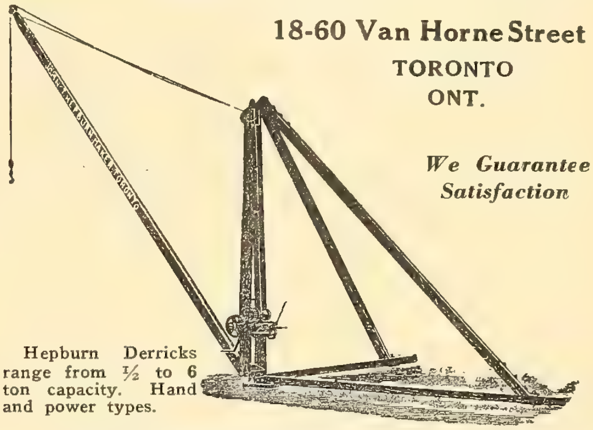

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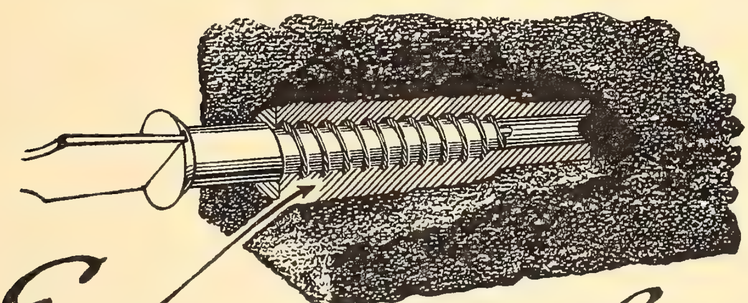

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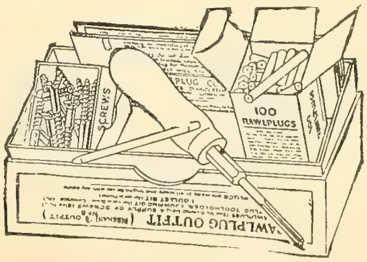

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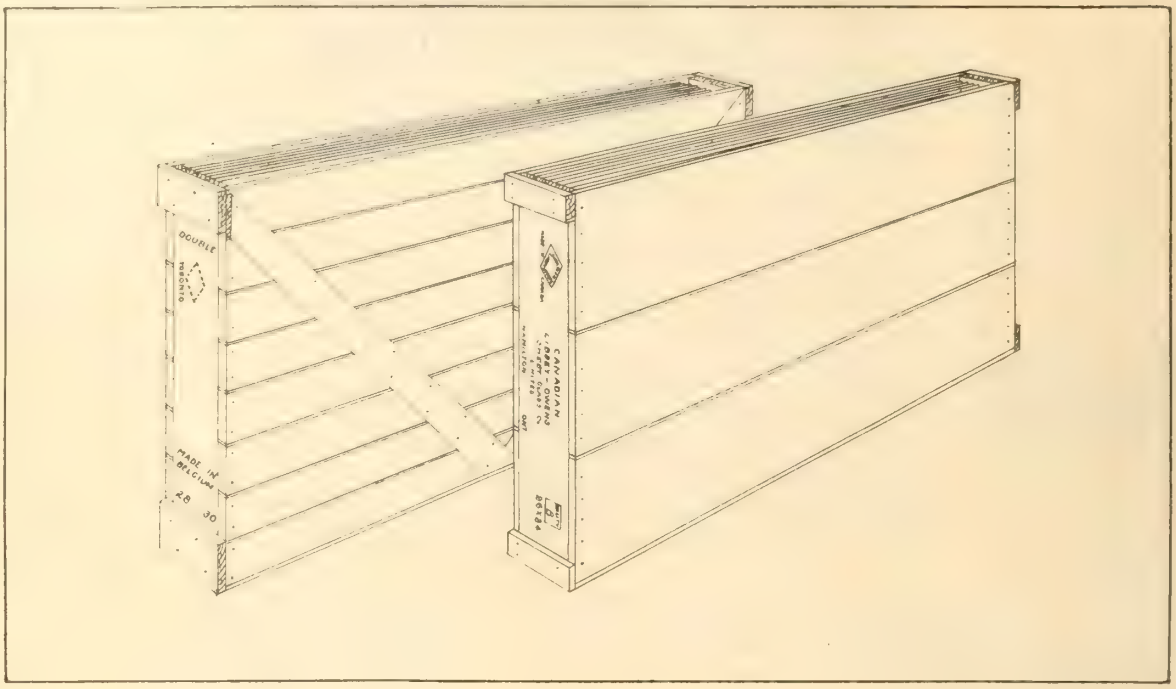

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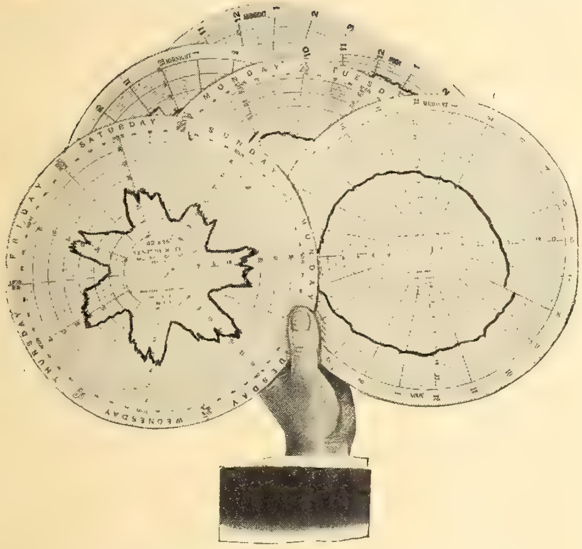

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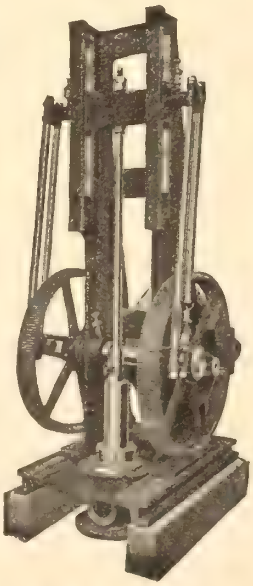

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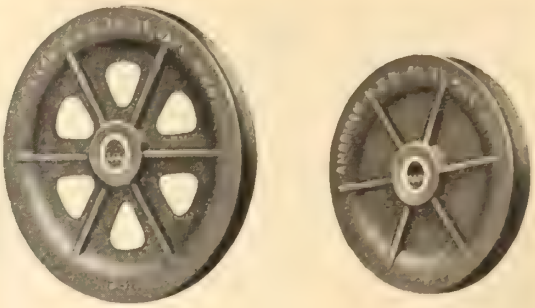

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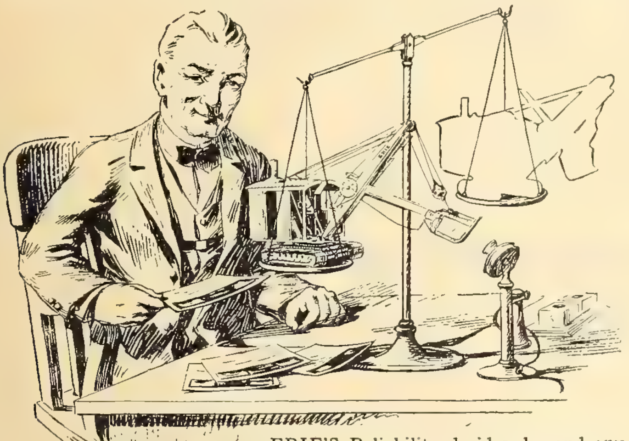

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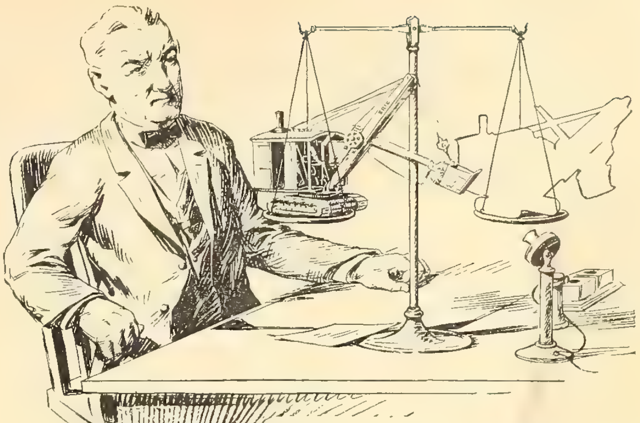

Weighing them in the balance: This contractor was undecided about which shovel to buy, before he sent out wires asking experienced shovel owners

and J. J. Thomson

of the Thomson Co., prominent Omaha contractors

answered:

Prefer the ERIE account of less repair expense less upkeep and delays.—J. J. Thomson, Omaha, Nebr.

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and R. B. Oliver, Little Rock, Ark., answered:

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and Clement F. Sculley Co., St. Paul, Minn., answered:

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and J. L. Shiely, St. Paul, Minn., answered:

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and Kahl Bros. Constr. Co., Cleveland, Ohio, and Davenport, Iowa, answered:

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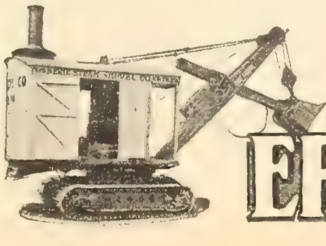

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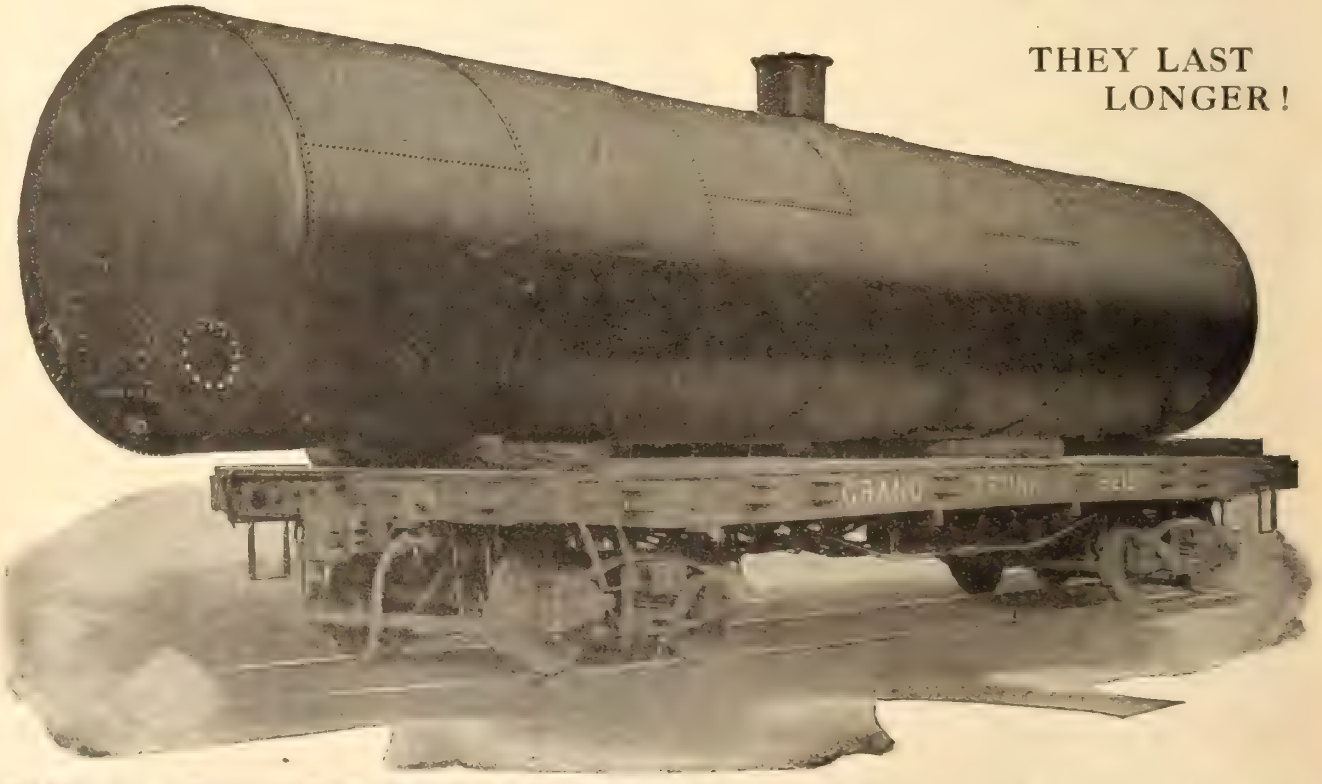

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Vol. 37 **Toronto, January 3, 1923** **No. 1**

How to Obtain Good Field Reports

Well written reports from construction superintendents, gang bosses, or other "men on the job" are not so commonplace that it is superfluous to go somewhat out of the way to comment on a particularly excellent one that has come to the editor's attention. It has almost always been taken for granted that the men in closest contact with construction operations, the gang bosses or foremen, are unable to write good reports concerning the work that comes under their jurisdiction and for that reason little has been expected of them. But, should little be expected of them? Are not the foremen the ones on whom superior officials depend most for the smooth running of all operations? Are they not in closer touch with the details of the job than any others? Indeed, their status in a construction organization is very similar to that of non-commissioned officers in the fighting forces, whom the military manuals refer to as "the backbone of the army." Granting then this vital relationship of the gang bosses to the whole organization, should not they be expected and required to submit reports to their superiors that are as complete as the nature of the job warrants? They need not be shining examples of rhetorical brilliancy, but at least they should review the writer's particular section of the work with such close detail that every reasonable question that can be asked by the chief engineer or superintendent can be answered solely from the facts contained in the report. So much time and effort can be saved by intelligent, comprehensive and dependable reports that it is a wonder that they are not more insisted upon than they are on the average construction job.

What it is possible to accomplish in this way is well illustrated in the article on page 4 of this issue, in which is printed a report from a road foreman that is as complete, intelligent and informative as any we have come across. Those who read it carefully will find that it contains about everything that the chief superintendent would want to know about the particular job to which this report refers. Especially complete is the cost data, this feature alone making the report one of outstanding merit. Yet it is but typical of all the reports that the county engineer of Victoria County, Ont., has been in the habit of receiving from his subordinate officials. Undoubtedly, many construction executives constantly receive reports of this character, but for those who do not, the one referred to is held up for the time as a model. If all engineers or superintendents in charge of large work would encourage the writing of similar reports, the benefits to both the writers and recipients of these documents would far outweigh the trouble expended. Clear, intelligent reports are indeed a necessity, the excellent value of which has scarcely been realized.

Securing Co-operation from the Job Foremen

No apology is offered for bringing into this discussion about construction reports the name of E. L. Miles, engineer of Victoria County, Ont., for it is through Mr. Miles' co-operation that we have been enabled to bring to the attention of our readers the report referred to in the previous editorial comment. Without seeking to disparage at all the excellent and efficient work of scores of other county engineers and road superintendents throughout the country, we think some credit is due to Mr. Miles for the very effective manner in which he has secured the co-operation of those working under him.

Attention was drawn several months ago in this column to the conference of county road officials which he instituted and which has grown to be of the greatest assistance in getting the county road work done economically and efficiently. Such gatherings cannot but prove beneficial for they enable such exchanges of ideas and experiences to be made as will equip the men all the better for their work. They go back to their respective duties with a new sense of their responsibilities, a better idea of how to solve their problems and a keener appreciation of the difficulties of the other fellow.

The encouraging of the foremen to write detailed reports of their work is just another step in the scheme and this Mr. Miles has apparently done with a considerable measure of success. The particular foreman who prepared the report on page 4 has already given four such reports this season and, as Mr. Miles states, "they have been most interesting and most beneficial to himself and his employers." He adds also; "It is really worth while to have a foreman of this type who can really give you an intelligent account of his work. It is wonderful what these unassuming men of the soil can do if only asked and encouraged." Encouragement of this kind pays and other superintendents and contractors are urged to develop a similar spirit of co-operation that will surely mean a greater measure of success.

Irrigation and Drainage in the Prairies

By E. F. Drake
Director, Reclamation Service,
Dept. of the Interior
Ottawa

In the southern parts of Alberta and Saskatchewan so little rains falls that to secure good harvests irrigation is a practical necessity during most years. On the other hand, in the northern parts of these provinces and in Manitoba there are in certain districts swamps and muskeg areas requiring drainage. These swampy areas are not due, as might be supposed, to excessive rainfall but are largely the result of poor surface drainage. Thus, two problems present themselves for solution: 1. Irrigation and 2. Drainage. The first problem is discussed in this article, while the second will be treated in a subsequent issue.

Part 1—Irrigation

Irrigation in Canada may be said to have had its beginning in the early "nineties." From the very first the federal government, taking a lesson from the earlier conditions in the states to the south which were very chaotic because of inadequate water laws, asserted its ownership of the surface waters and proceeded by means of comprehensive surveys to investigate the possibilities of developing the semi-arid region. These investigations have since been carried on almost continuously by the Reclamation Service of the Department of the Interior, so that at the present time practically all of the large irrigable tracts for which water can be made available at reasonable cost have been completely investigated.

The most suitable tracts, which were the first to be surveyed, were early acquired by companies which have since constructed works to irrigate them. The construction of these projects by private capital represents the first phase of large-scale irrigation development, some idea of the magnitude of which may be obtained from the following table:

Project	Irrigable Area (acres)	Cost of Canals to 1921	Mileage of Canals
C. P. R Lethbridge project	130,000	$ 1,874,601	200
C. P. R. Western project	218,980	5,116,252	1,469
C. P. R. Eastern project	400.000	10,924,738	2,500
Canada Land & Irrigation Co. project	202,640	6,473,207	355

Large-scale development by private corporations is probably a thing of the past in Canada because there are no more large tracts of land capable of irrigation which could be acquired at sufficiently low rates to make the construction of irrigation works a profitable investment for private capital. The one condition which made possible the success of the four projects above mentioned, considering that they had to be settled after completion of the works, was the very low cost at which land was secured.

Present Developments Are Co-operative

At the present time large-scale irrigation is developing along co-operative lines. In Alberta this phase of development has made rapid progress within the past few years, under the stimulus of five successive dry seasons and with the encouragement and assistance, legislative and financial, of the provincial government.

The Taber project, which is irrigated by an extension of the Canadian Pacific Railway Company's Lethbridge project canal, was the first to be constructed under the co-operative plan and has now been successfully operated for two years. The Lethbridge Northern and United projects are approaching completion and are expected to be in operation next spring; these two projects have been financed by bond issues guaranteed by the Alberta government and secured by the land to be benefited. Two others, the South Macleod and New West projects, are ready for construction, but have not to date secured provincial guarantee for their bonds, lacking which these have no market. The area and cost are as follows:

Project	Irrigable Area (acres)	Cost of Construction
Taber project	17,244	$ 272,000
Lethbridge Northern project	105,000	5,400.000 (estimated)
United project	23,000	524,000 (estimated)

Diversion weir on the Oldman river from the west wing wall

South Macleod project	49,649	2,060,000 (estimated)
New West project	7,629	385,000 (estimated)

It seems improbable that there will be much further co-operative development for a few years, or until the projects which have already been constructed have proven their worth.

Prospective Developments

In addition to the five projects cited, which represent time, there are a number of other projects in various stages of organization of which more or less complete surveys have been made by the Reclamation Service. These represent a potential development of great importance to Canada. Divided into small holdings each provided with a water right, the lands comprised within them support in comfort many thousands of settlers. Data regarding the most important of these projects are given below:

Project	Estimated Irrigable Area (acres)	Estimated Cost of Construction
Eyremore project	4,100	$ 250,000
River Bow project	5,792	314,000
Champion project	50,000	(no estimate)
Retlaw-Lomond project	70,000	2,500,000
Lethbridge Southeastern project	390,708	15,800,000
Beaver Creek project	9,000	450,000
Willow Creek project	4,500	260,000
Robsart-Vidora project	10,000	343,000
North Saskatchewan project	1,778,784	(no estimate)

Lethbridge Northern Irrigation District

In June 1921 tenders for earthwork were considered and the contract, amounting to 6,000,000 cubic yards, 371,000 cubic yards of which were solid rock, was awarded to Messrs. Grant, Smith and Company and McDonnell, Ltd., at $1,660,279.40. This firm let the greater portion of the work to subcontractors, who again sublet to men with small outfits. The work was commenced shortly after the awarding of the contract and was carried on vigorously throughout 1921 and 1922.

Kenex syphon, 10 ft. 6 in. diameter, under construction.

The headworks are on Oldman river in the Peigan Indian Reserve about ten miles west of the town of Macleod. The water is diverted into the main canal by a concrete overflow weir across the river bed which is joined to an earthern wing dam extending across the remainder of the valley. Three miles below the intake the main canal approaches the river and is carried across by a semi-circular steel flume 3,322 feet long and 33 feet high. This flume is 14 feet 4 inches in diameter and is supported by steel bents resting on concrete piers. The contract for the flume proper was let to the Pacific Sheet Metal Works, Ltd., at $11.25 per linear foot, $37,372.50 being the total cost of the flume.

Below the Oldman river flume for about thirty-five miles the canal has a bed width of 33 feet and side slopes of 1½ to 1, carries a 7 ft. depth of water and has a discharge of 810 cubic feet per second. At Mile 16 another flume, 651 feet long and similar in construction to the one already described, crosses Willow creek. This structure has reinforced concrete inlet and outlet portals and is supported over the creek by three 80 foot steel truss spans on concrete piers. Over the remainder of the valley to canal grade timber trestle supports are used. The contract for this flume was also awarded to the Pacific Sheet Metal Works, Ltd., at $11.25 per linear foot.

Thirty-eight miles from the intake is the Rocky coulee syphon, a wood stave pipe structure 2,875 feet long, 10 feet 6 inches in diameter, set in 575 timber cradles. The contracts for the Rocky coulee syphon and for another known as the Kenex syphon, 930 feet long, were awarded to the Canadian Pipe Company, Ltd., of Vancouver, at $32.15 per linear foot or a total of $121,687.75. The contracts called for the design, manufacture, shipment, and complete erection of the structures.

Construction work is now practically completed. A little work on structural contracts remains to be done but this can be finished before the irrigation season opens next spring.

The United Irrigation District

This district, comprising 23,000 irrigable acres, is ideally situated for canal location and the distribution of water into secondary channels. The low cost of construction per acre of irrigable land (about $25.00) is largely attributable to this fact. From the point of intake on Belly river to the lower end of the canal system no difficult engineering features are encountered, although an unusual number of drops and chutes are required in places where the water is carried down steep hillsides.

For construction purposes the district officials decided to let small contracts to ratepayers on the following basis: Sixty per cent. to be paid on monthly estimate, fifteen per cent. to be paid on satisfactory completion of the contract, and twenty-five per cent. to be retained and held in trust to apply on assessments to be levied on the lands to cover the bonded indebtedness. Conditions were particularly favourable for small contracts as no expensive machinery was required and a considerable number of the ratepayers had previous experience in construction work. The results have amply justified this policy in this particular instance.

Excavation work was commenced in October 1921, and was carried on steadily until completed. The earth excavation amounted to about 760,000 cubic yards. The structural contracts are now practically completed and it is expected that the works will be ready for operation in the spring of 1923.

Good Reports from the Man on the Job

The Kind That the Road Foremen of Victoria County, Ont., Submit to the County Engineer—Intelligent, Comprehensive and Informative Field Reports are all too Rare

E. L. Miles, road superintendent of Victoria county, has sent to the editor a report that is typical of those received by him from his construction foremen. On account of its interest and completeness it is reprinted below as a splendid example of how such a report should be written. As a general rule, there is much room for improvement in the reports which the men on the job submit to their superiors. In many instances they are sadly lacking in completeness and in general they are poorly prepared. The particular report which is printed herewith has little, however, to criticize and in publishing it in full, it is with the intention of encouraging the writing of intelligent and informative reports. Mr. Miles has explained the value of such documents in the following extracts from a recent letter.

"I am enclosing a copy of a field report received from one of my construction foremen, and I have thought that it might be of interest to you because of the fact that it has been written by the "boss of the gang" and also because of the idea that it is worth while to have a foreman of this type, who can really give you an intelligent account of his work.

"I might say that this foreman, Mr. E. E. Maw, has given me 4 reports on his work this season, and they have been most interesting to me, and most beneficial to himself and his employers.

"I would think that other superintendents or even contractors would find this method of cost keeping most interesting, and I might add that it is wonderful what these unassuming men of the soil, who from all appearances know only "the day work," can do if only asked and encouraged.

"The idea of sending you the report is not to impress you with the details of cost, but rather with the completeness of it, as you will note that every question that it is possible to ask, can be answered by some combination of the figures."

The report which he refers to is as follows:

Lindsay Dec. 20th, 1922.

Mr. E. L. Miles,
County Road Superintendent,
Lindsay, Ont.

Bituminous Bound Macadam—Little Britain North—
Road 40, Mariposa

Dear Sir:—

Previous to construction, this road was of the gravel type about 12″ thick, carrying a very high, narrow crown almost to the extreme north end. The center of the road at the north end was inverted and was the course of the water from the adjoining lands as far north as concession 6. From the bridge north, the old road gradually swung to the east and at the north end, it was in the line of the newly constructed ditch. The subsoil of this road was a very sticky brown clay with little or no drainage and the water at times flowed over the sidewalks.

On August 14th, the county road construction outfit under my supervision pitched camp at the northern end and commenced grading, ditching and draining on the morning of the 15th. The work progressed with very little delay and at the end of two weeks, a uniform grade had been made with suitable ditches on both sides leading to the creek. At intervals of about fifty feet and in all depressions, stone drains have been placed leading into these ditches to ensure proper drainage. Rock was secured from Crushed Stone Limited and was shipped from their Kirkfield quarry via G.T.R. to Mariposa station. From this point, it was hauled to the job, a distance of two miles. On October 12th, the work was completed after a period of 50 working days.

The total length of the work was 2410 feet, and the travelled roadway is 28 ft. in width from shoulder to shoulder. The metalled surface has a width of 20 ft. being of the Bituminous Bound Macadam type. The shoulders are covered with pit gravel to protect the edges, The macadam portion has a crown of 5 inches and is about 3 ft. above ordinary water level in the ditches. Tile entrance crossings 15 ft. in width have been provided to allow access to adjoining property.

The work commenced with the digging of suitable ditches on both sides, these being dug with the plow and slip scrapers. The earth removed was utilized in the building of shoulders. These shoulders were placed on either side of the center line and 28 ft. from out to out. This being accomplished, the stone drains were placed at suitable intervals leading into the ditches. The base course was then laid, being of stone of the 4″ size. This course varied in depth according to the condition of the old road surface and was laid to give a uniform grade. This course was then sealed with 1 inch of grit and rolled solid. A course of 2 inch rock was then placed on this base to a depth of 3 inches. This course was not rolled until it had been penetrated with Tarvia X at the rate of 2 gallons per sq. yd. Immediately after the penetration it was rolled until the 12 ton roller left no impression. A course of ¾ inch rock was then spread on top of this, about 1 inch in depth, and was not rolled until penetrated with

Tarvia X at the rate of ½ gal. per sq. yd. This was then rolled perfectly solid and a thin layer of clean ⅜ inch rock was spread evenly over the surface, the spreader using brooms for this purpose. This course was rolled until it was imbedded firmly in the last penetration. Then came the finishing course of rock grit. This grit was spread very thin and evenly and was broomed into every crevice during the rolling. The seal coat of Tarvia B will not be applied until the road has been subjected to the August heat of 1923, the superintendent considering that the Tarvia X has a better chance to bleed, and the final coat of grit a better chance to work into the road under a season's traffic than if sealed during construction. When all the various actions under heat and traffic conditions have ceased, the road is then ready to seal up, and is likely to stay intact.

Cost of Material Only

Purchase of crushed rock	$2.235.92
Freight	1,894.03
Purchase of field stone	10.00
" " tile	502.00
" " catch basin grates	24.70
" " cement	33.19
" " Tarvia X	2,528.23
Freight Tarvia X	355.45
Purchase of gravel	34.20
Total cost of material	$7,617.72

. . Unit Cost of Labor Only

Quantities	Total Cost	Unit Cost
1,850 cu. yds. earth	$ 652.85	.35¼ per cu. yd.
1,643 cu. yds. Cr. rock	2,087.98	1.27 per cu. yd. or $6.03 per cord.
257 cu. yds. gravel	308.40	1.20 per cu. yd.
11 cords field stone	33.00	0.63 per cu. yd. or $3.00 per cord.
Heating, spraying, etc.		
13,195 gal. Tarvia X	305.00	.02⅓ per gal.
4,320 ft. ditch cleaning	45.00	.01¼ per ft.
15 entrance culverts 18″ diam.	54.00	$3.60 each.
12 entrance culverts 15″ diam.	35.00	2.91 each.
187 ft. drain 15″ diam.	191.20	
190 ft. drain 24″ diam.		.50¾ per ft.
30 culverts 18″ diam.	12.00	.40 per ft.
Total cost labor	$3,724.43	

Volume of Work

1,850 cu. yds. earth	
1,643 cu. yds. crushed rock	2 mile haul
257 cu. yds. gravel	1¼ mile haul
13,195 gal. Tarvia X	2 mile haul
11 cords field stone	½ mile haul
7,500 sq. yds. road surface, 28′ wide	
5,370 sq. yds. metalled road surface, 20′ wide	

Wages

Foreman	40c. per hour	
Engineer	45 per hour	Roller
Teams	60 per hour	
Labor	30 per hour	
Engineer	40 per hour	night watch
Expert	40 per hour	penetration

Train haul from Kirkfield, G.T.R.—85c. per ton
107 sq. yds. completed per day

Results

Road complete, $11,342.15 or at the rate of	$24,849.19 per mile
Grading	1,430.31 per mile
Metalling	13,622.59 per mile
Penetration	6,985.98 per mile
Gravelling shoulders	750.59 per mile

Cost of metalling per sq. yd.	$1.16
Cost of penetration per sq. yd.	.59½
	$1.75½
Cost of total road surface per sq. yd.	$1.51

Yours truly,
Ernest E. Maw,
Foreman

Letters to the Editor

Publication of Day Labor Costs

Montreal, December 15th, 1922.

Editor, "Contract Record,"

At the beginning of your article under the title, "Is Day Labor Cheaper than Contract?" which appears on page 1175 of the issue of December 13th, 1922, I note the following query:

"Do you think that public bodies doing work by day labor should be compelled to publish on the completion of the work a true itemized account of the cost, including proper overhead—?"

May I answer emphatically: "I do believe."

But I also believe that it would be a very good plan to compel public contractors, just as we do public service corporations, to do likewise; for the day is rapidly passing when the details of business are considered the sole concern of a private owner.

And as this seems to be a sort of sporting proposition, I would suggest that either day labor work be relieved of or contract work assume some of the disabilities under which public bodies have to struggle along when doing work by direct employment.

The disabilities I have in mind are such as the civil service rules in some places; the compulsory employment of public pensioners who could not, even if they would, deliver a full day's work in other places; the legal restrictions placed upon public officials by brilliantly stupid lawyers whose only idea of control is "thou shalt not;" and many other like handicaps.

I have had to operate day labor under municipal civil service rules that were destructively obstructive—they are not all necessarily so—and I wondered what would happen to the efficiency of a contractor's organization if he had to do likewise.

On the other hand, I think day labor work should be charged up with all possible legitimate overhead expense, including full supervision, taxes or their equivalent, interest on money employed, depreciation of equipment, and so forth; but I omit profit, campaign funds, and other similar items of expense that are peculiar to the contract system and have no place in day labor work.

A contractor's legitimate compensation for his own work—if he is not an absentee contractor—cannot be classed as profit; it is wages—of sin sometimes; but usually for value received. Contractors are as good or as bad, no better nor worse than the rest of us.

Sincere contractors as well as sincere public officials should welcome the publication of full details of cost by both; but I am personally fully in favor of complete publicity on the part of public officials even though some contractors be such short-sighted citizens for the present as to refuse the publication as regards their own work.

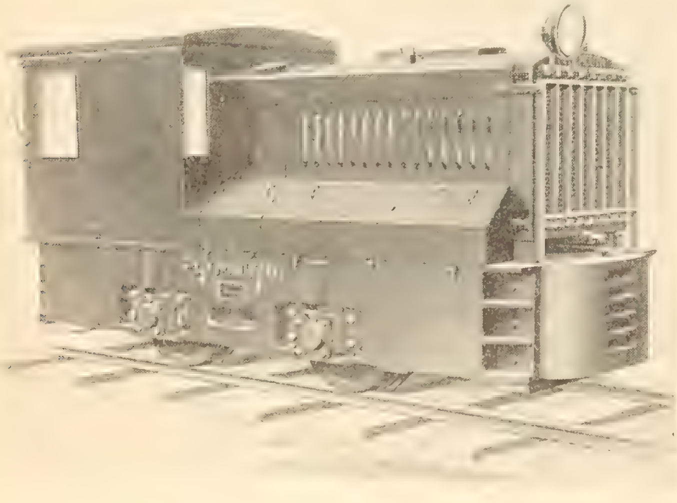
Yours very truly,
Charles A. Mullen, M.E.I.C., M.A.S.C.E.,
Consulting Paving Engineer.

Machinery & Equipment

New Gasoline Locomotive Develops Remarkable Drawbar Pull

In the 7 ton, 4 speed, Gear Drive Gasoline Locomotive announced by The Fate-Root-Heath Company, Plymouth, Ohio, the manufacturers claim that in actual haulage test it developed and maintained a drawbar pull of 5250 lbs. on sanded rail. The four speeds are 2½, 4, 8, and 12 miles per hour, either forward or reverse.

This remarkable showing is claimed to be due to the unique design and construction of the transmission. The gears are unusually large and massive, an exclusive feature being an additional final driving gear, 14½" diameter by 4" face. This gear permits of the proper speed reduction, and also places the sprocket shaft which it drives on the same plane with the axles, so that no jackshaft is required. The other gears are 2" and 2¼" face, of large diameter.


A new 7-ton, 4-speed gasoline locomotive

The sliding gears are made in pairs on the second driving shaft, giving extra long hub strength, and reducing wear to a minimum. The gears that are driving are the only ones that are in mesh. Forward and reverse speeds are obtained by large bevel gears with internal gear teeth into which the pinion that drives the main gear meshes, thus doing away with jaw clutches.

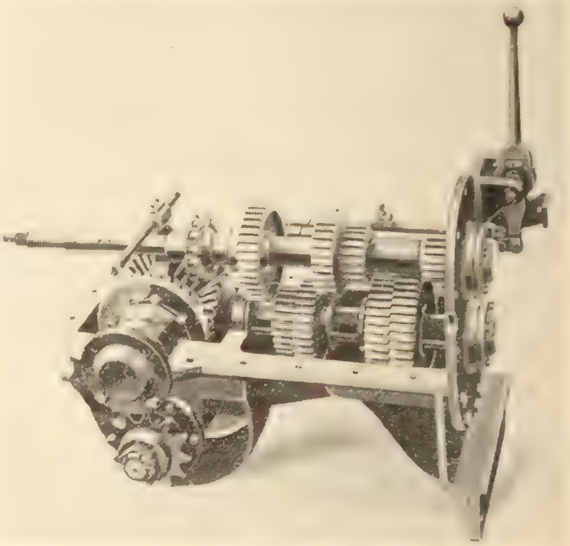
All gears are of alloy hardened steel, mounted on extra large shafting and ball bearings. Bearings are all inside gear case, from which they receive their lubrication, requiring no special attention, and insuring permanent alignment at all times.

The final drive is by means of two short heavy chains, on to each axle, driven direct from the transmission.

The power plant, is a Buda heavy duty engine, 4 cylinders, 5 x 6½, equipped with Bosch high tension magneto, Bosch starter and lighting system; Pierce governor and Stromberg carburetor. The radiator is a Modine sectional core type, cooled by 24" fan and protected by heavy steel guard.

The clutch is of the dry plate type, with nine driving discs faced on each side with non-burnable facings. It does not require oiling, and is very smooth in action.

The axles are mounted on Hyatt heavy duty roller bearings, with hardened steel sleeves to take the wear. Axle end thrust is taken by bronze thrust plates placed in the axle boxing caps, which provide perfect lubrication. Axle springs are 12¾" long, so that wheels readily follow uneven track, make easy riding, and give excellent traction.


The transmission of the new Plymouth locomotive

Brakes are placed between the wheels. Brake shoe covers both tread and flange of wheel. The lever type of brake rigging is used, producing the same pressure on all four wheels, regardless of wear on wheels or shoes.

Sand boxes are located high behind engine which keeps sand warm and dry. Sand pipes hug the rails, placing sand directly on the rails. The valve does not slide on its seat, preventing wear. Sand is agitated when valve is opened, insuring positive flow.

The frame is of massive construction and built close to the track. Bumpers are arched so as not to derail cars in rounding sharp curves. The cab and canopy are of all-steel construction, easily disassembled. The cab has a side as well as a rear entrance.

The Burlington Steel Company, Ltd., Hamilton, Ontario, are distributing a very remarkable perpetual wall calendar. The background is designed with reinforcing steel, while the name and address of the company is prominently printed in bright steel letters. The calendar itself is of ample size, the figures being five inches in height.

The Water Supply of Montreal

A Review of the Development of the Montreal Waterworks—The Program Now in Hand and the Methods Used in Carrying it Out

By the Contract Record's Montreal Correspondent

(Concluded from the last issue)

Part of the work undertaken under the two previous enlargement schemes had been the widening of the aqueduct immediately above the wheel house or terminal dam, the idea being to impound a greater quantity of water to meet all future emergencies.

In connection with this latest scheme a consolidated fill or earth embankment has been built to replace the bank formerly removed during the progress of the former work on enlargement. This embankment will be 16 ft. wide across the top with a slope of 1½:1 on the outside and 2:1 on the inside face; the latter having a berm 6 ft. wide at a constant elevation some distance below water level. At the maximum section of this dam the height will be 28 ft. and the width of the base 120 feet.

An extension has recently been constructed to the gate house which admits water to the present filtration plant. It consists of a chamber 25 feet long, 19½ feet wide and deep enough to take two 8 feet by 8 feet intake conduits controlled by stop logs and equipped with screens. Connection is made to this gate house extension by means of an 8 ft. diameter opening and an additional opening is left to permit of future addition of a second conduit between this point and the filtration work.

An emergency intake for direct connection to new pumping has also been built into the south bank.

Bridges and Structures

Where the river road crosses the aqueduct a bridge called the Lasalle Bridge has been built. This was built before the formation of the present Board and has stop-log gates for regulating the flow of water into the aqueduct. Proceeding in an easterly direction down the aqueduct, and following the flow of water, the next structure encountered is a beautiful concrete bridge spanning the canal at Latour Road. In the design of this bridge the Board has anticipated the growth of the city towards the west and has designed it to carry a double line of tramways as well as any heavy motor traffic. Pedestrian traffic is also provided a safe means of crossing. This structure is complete in every detail and ready for use, if not already being used.

Proceeding further we come to the completed sub-structure of an intended crossing called Knox Bridge consisting of piers and abutments ready in place. These piers and abutments are made of reinforced concrete and are left in such a condition that the superstructure may be added at a future date when necessity demands it. The reinforcing steel, dowels and checks are all provided so that the superstructure may become as nearly monolithic with the piers as possible. When the canal is running full to capacity the piers will be submerged but the gates at Lasalle Bridge will be partly closed to reduce the level in the canal where any future work is to be started.

The next structure we come to is another reinforced concrete bridge, already completed, on the farm of the Verdun Asylum which is situated just outside the western limits of the

Force main crossing of tail race under construction

City of Verdun. This bridge is not so massive and strong as other bridges already made and also those proposed. It is thought that it will be some considerable time before the Asylum property will be taken over for other purposes, so a smaller bridge was deemed sufficient.

Two other bridge sub-structures follow in quick succession; one for the proposed continuation of Monk Boulevard and one for Woodlands Ave. crossing. These are built almost following the plans of the one above described, except for changes due to soil conditions. The choice of a design for the various superstructures is left until a future date, and will necessarily depend on the type of sub-structure.

Crawford Bridge

We come now to one of the most important structures in connection with the aqueduct, namely the Crawford Bridge. It is located half way along the length of canal between the intake at Lasalle Bridge and the pumping station at the eastern end of the canal. It serves two purposes; first as a bridge and, second, as a water regulator.

Attention should be again drawn to the fact that the Board have kept always in mind the absolute necessity of guaranteeing an uninterrupted supply as far as was in their power. With this consideration in view they had constructed a huge lateral conduit (area 57 sq. ft.) which is buried in the north bank of the canal and running its full length from intake to pumping station. Its purpose was to provide a supplementary supply to that supplied by the open aqueduct. The addition of this conduit really guarantees various means of bringing water to the pumping station. The real purpose of Crawford Bridge was to afford a direct connection between the open aqueduct and the buried pipe by means of a control ram and a water chamber in the sub-structure of the bridge. The level of the water above the bridge is regulated by stop logs. This precaution will ultimately supply four ways of getting water to the pumps viz; by open canal; by conduit only; by upper half of canal and lower half of conduit and lastly by upper half of conduit and lower section of the canal. Using the canal in conjunction with the lateral conduit will reduce by 50% the loss of head in the conduit due to friction as river level may be brought down to Crawford Bridge by the proper adjustment of the stop logs. This combination appears certain to guarantee a steady supply of water. A detailed and elaborated description of Crawford Bridge appeared in the "Contract Record" some months ago.

Church Bridge

The next structure east of Crawford Bridge is the Church Ave Bridge. This is a very handsome bridge of reinforced concrete of massive style and construction intended to carry all kinds of traffic including a double line of tramways which is already in operation. This bridge will be the most used of any as it serves as the only means of connection between the City of Verdun and the western end of the city of Montreal.

At the eastern end of the canal it widens out to form a large basin or reservoir and in the east corner of the basin a spillway has been built onto the southern end of the old wheel house. The spillway is equipped with a sluice gate and stop logs which will enable them to regulate the level of the water in the basin. The Board had a definite object in mind when they decided to instal this spillway, namely, to so regulate the level as to supply water to the wheel-house at a definite and constant head. They intend putting in 2 new water wheels in this old wheel house so as to make practical use of the circulating water in the canal to develop electricity. It is proposed to instal two 1,000 h.p. wheels driving two electrical generators, the power of which will be used either as auxiliary or as steady power to run the pumps. This will reduce their power costs in 2 ways. First, the actual value of the power they propose to develop is about $80,000.00 per annum, and second, by using this power in the new pumping station they will reduce the peak load supplied by the power company thereby saving the premium which is paid upon the peak load.

Present Methods of Supply

In May 1920 when the Water Board was formed their first decision was to change the installation of the present pumping station from steam power to electrical power. This was gradually accomplished by changing one unit at a time until all four units were finally being electrically driven by May, 1921. At present the water is being supplied to the city mains and reservoirs by three 30,000,000 gals. per day and one 15,000,000 gals. per day units making a total capacity at present of 105,000,000 gals. per day. There is also a pumping station on MacTavish St., on the higher level, which supplies the consumers residing high up on the side of the mountain. A large proportion of the water now supplied is drawn from the old filtration basin—at least all that is supplied for domestic use. The capacity of the pump being used at MacTavish St., is 12,000,000 gals. per day.

Future Filtration and Pumping

They have provided alternative means of getting water to the pumps from the canal by the installation of one emergency intake direct to the pumps. This is a big 9 ft. 0 in., diam., steel conduit of circular cross section entirely encased in a heavy concrete casing and leading directly to the pumping house intake. The regular means of supplying the pumps at present is from the large filtration basin situated some distance to the southwest of the end of the canal. There will necessarily be an intake from the canal to this basin as it is a thoroughly modern plant and is to become part and parcel of the future system. This intake is already completed. Besides this second intake they have also constructed an intake to connect with a filtration plant extension which will be built at some future date in close proximity to the present plant. These 3 intakes are all built into the south bank of the aqueduct and are ready equipped with sluice and stop log gates. When the filtration plant extension is finished it will constitute a third means of assuring the water supply, at least up to the pumps, as one basin can be used independently of the other.

Pumping Station

The new pumping station building is already completed except for a few minor details inside and the installation of the machinery. It is situated between the eastern extremity of the aqueduct and the present filtration plant. It occupies ground space that had already been owned by the city. It is a very fine building, beautifully constructed and very efficiently designed. It contains the most modern mechanical and electrical equipment that is manufactured, set up in an efficient manner. The complete installation will consist of six 30,000,000 gals. per day electrically driven pumps supplying a total amount of 180,000,000 gals. per day when all are running. The station has been designed in such a way that it may be extended towards the south to form a symmetrical building and duplicate the pumping equipment now being installed. This phase of the work is important enough to require special mention which will appear in "Contract Record" at a future date. We will only say here that it has been extremely well built by the Atlas Construction Co., following the design of the Board's engineer.

A large basin or reservoir is now under construction by E. G. M. Cape & Co., which serves as the immediate supply for the pumping station. It has an impounding capacity of about 25,000,000 gals. and is situated just outside the pumping station west wall. It is really an intermediate stopping place for the water as it comes from the filtration plant on its way to the pumps, and was designed for the purpose of maintaining a constant head on the pumps as well as extra storage. It will also have a connection to the future filtration plant. It is now about 20% completed, but the contractors have a large crew and modern equipment on the spot and should prosecute the work to a speedy conclusion.

A contract has recently been awarded to this same contractor, i.e., Cape & Co., for the construction of a distribution control building. As the headers come from the pumping station they will be directed into this building where each one will be divided into two 48 inch diam. force mains which in turn will be led out to different parts of the city. In conjunction with the headers from the pumping stations and the force mains there is an elaborate system of main valves and transfer valves by means of which the water may be directed from the heads into any combination of force mains. These valves are all operated electrically and are controlled from the main control room of the pumping station by push-button control. This central control room is a modern miracle of electrical and mechanical science, all the valves being controlled directly by the man at the bench and all instructions to employees in the new pumphouse being given by signal. The workmen who look after the various units also communicate in their turn with the chief operator by means of electric flash signals.

Force Mains

After the force mains leave the distribution control building they are directed a short distance to the point where they will have to cross the tail race and overflow canal below the old wheel-house at the end of the aqueduct. This crossing is made by means of a heavy concrete bridge which has been designed to carry 7 of these 48 inch mains. Provision was also made in the design for the bridge to carry moderately heavy loads on the surface roadway. It is faced on all visible parts with Hydro-Stone. It crosses the tail race from the wheel house in a position almost touching the wheel house wall.

View of pumping station taken from the west side, showing the type of construction used in the intake, the whole being encased in concrete

Tunnel Under Lachine Canal

Following the force mains further in their course we come to the Lachine ship canal crossing. This has been managed by making a tunnel under the canal lined with reinforced concrete and large enough to comfortably accommodate 3 of the 48 inch force mains. Plans and specifications have already been prepared for the laying of a new 48 inch diam. force main from the new pumping station to a point near the corner of De Lorimier Ave. and Sherbrooke St., a distance of 20,000 ft. As the city increases in size other force mains will be laid.

The present distribution of water throughout the city is obtained by means of steel force mains, the size depending upon the district served. This present system will be connected to the new pumping station and incorporated in the general Waterworks scheme.

List of Contractors

The following is a list of the contractors who have been engaged on the work during the past several years, more particularly since the formation of the Board.

The removal of the surcharge from the concrete retaining walls in the western section and also the repair work done on the displaced section was done by G. L. Campbell at an approximate cost of $135,000.00.

The south bank gravity wall for a distance of 6,000 ft. adjacent to Crawford Bridge was done by Doherty, Quinlan & Robertson, the cost being about $160,000.00.

The Crawford Bridge and dam and the connection to the lateral conduit were constructed by the Atlas Construction Co., at an approximate cost of $130,000.00.

The eastern section or earth section was done by Atlas Construction Co., at an estimated cost of about $680,000. It is about 98% complete at time of writing.

The Latour Bridge piers and abutments were put in by Doheny, Quinlan & Robertson for an amount of about $17,000.00 and the superstructure of this bridge was built by J. T. Levasseur at an approximate cost of $43,000.00.

The Knox Bridge piers and abutments were also put in place by Doheny, Quinlan & Robertson at a cost of $15,000.00.

The Kennedy Construction Co., had a big share of work as follows: The Asylum Bridge cost $22,000.00 complete; The Monk Boulevard and Woodlands Ave piers and abutments, $31,000; The Church Ave Bridge wing walls, $26,000.00.

The force main crossing bridge over the tail race behind the old wheel house is about to be completed by A. F. Byers & Co., at a cost of approximately $45,000.00.

The new pumping station has been constructed by the Atlas Construction Co., at a cost of about $500,000.00.

The new reservoir and the new distribution control building are to be constructed by E. G. M. Cape & Co. The cost of these has not yet been determined as the reservoir is only about 20% completed and the other building not yet started.

The steel frames for the intake as shown in the photograph were supplied by the Pheonix Bridge Co.,

The electrical equipment in the new pumping station is being supplied by the Canadian Westinghouse Co.

The pumps have been designed and made by the Dominion Engineering Works.

The above information was given to our Montreal representative by Mr. C. J. Desbaillet and Mr. Dorrance, chief engineer and division engineer, respectively, of the Montreal Water Board. We take this opportunity of thanking them.

Steel High Pressure Pipe Line Installed by the City of Ottawa

A 51-inch Main, Three-Quarters of a Mile Long and Including Eighteen Bends, was Placed and Rivetted in Sixty Working Days —Pipe Tested to 225 lbs. Water Pressure

By R. E. W. HAGARTY

A noteworthy installation has recently been very successfully completed in Ottawa by the Canadian Des Moines Steel Company, Ltd., of Chatham, Ontario, in the building and laying of a large high pressure water main.

When tenders were called by the City of Ottawa for the supplying of the pipe, several different types and materials were submitted but the rivetted steel pipe was chosen as the most economical type of construction.

The pipe is 51 inches in diameter and was designed for a working pressure of 150 lbs. per square inch. It was built of 7/16 inch plates, 100 inches wide, each rolled to a circle and joined with a 3/4 inch triple rivetted double butt joint. Three of these rings put together in the shop with 3/4 inch single rivetted lap joints made of 24 ft. 6 in. length which weighed about 3½ tons. This length was the standard shipping unit.

Three Quarters of a Mile Long

The total length of pipe was nearly three quarters of a mile and included eighteen bends of various degrees, some horizontal and some vertical, as well as valve connections and five expansion joints.

Each unit when rivetted was tested at the shop to a cold water pressure of 225 lbs. per sq. inch. For this purpose bulkheads made of 9/16 inch plate dished and flanged were used and the pressure was supplied by a double acting steam force pump. The results of the tests were very gratifying showing that the design and the shop work were both excellent.

The tests being successful the pipes were heated in an oven and then dipped in a hot bath of coal tar as per Dr. Angus Smith's specifications. This bath was maintained at a temperature of 300 deg. Fahr.

After five minutes in the bath the pipe was put in an automatic wrapping machine and covered with a layer of Jute Hessian cloth. It was then dipped again in the tar and loaded on flat cars.

Five or six lengths constituted a car load and twenty-five cars were required to transport it.

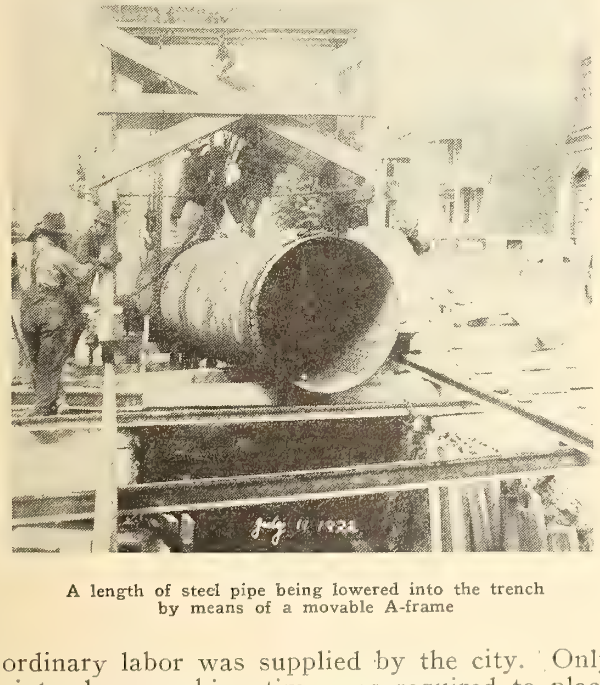
On arrival at Ottawa the pipes were distributed ready for the city's department to excavate the trench.

When the trench was excavated a track was laid on either side and a movable "A" frame with heavy block and tackle used to lower the pipes into position. Five lengths was the minimum laid and rivetted in one day. The pipes were then lined up and the joints rivetted with pneumatic hammers.

When the line was completed it was again tested with 225 lbs. per sq. inch water pressure which test showed absolutely satisfactory workmanship.

Work Carried out Jointly

The erection was done jointly by the City of Ottawa and the Canadian Des Moines Steel Company. The company superintended the job and did the fitting, rivetting and caulking. The ordinary labor was supplied by the city. Only sixty days working time was required to place the pipe and rivet it complete.



A length of steel pipe being lowered into the trench by means of a movable A-frame

The construction and installation of the pipe line was at all times under the general supervision of Mr. A. F. Macallum, Commissioner of Works and Mr. W. E. McDonald, waterworks engineer of the city of Ottawa.

Steel has been successfully used for water mains and high pressure lines for a number of years and has proved very economical and of long life. Some interesting instances where steel pipe has shown long life have just come to light. In 1893 an intake pipe, 3,200 feet long, was installed in the village of Bangor, Penn. This pipe was of 3/16 in. metal and was half submerged in the bed of Martin's Creek and was at all times exposed to the weather. Deterioration of the pipe showed in 1912 after doing service for 19 years.

The pipe line being rivetted with pneumatic hammers

Other instances where steel pipe has shown long life are at New Bedford, Mass., where a 48 inch rivetted steel water main has been in use since 1896 and when examined in 1913 was in such excellent condition that very few repairs were required and the pipe is still doing service, showing a life of over twenty-five years. In the city of Newark 28 miles of steel pipe ranging from 42 inch to 60 inch in diameter have been giving service since 1891, giving a life of over thirty years.

Housing in Toronto

Mr. George Birdsall, of Toronto, built 16 six-room and sun room houses on Evans Avenue, in that city, this year. These were of brick construction and sold at $6,000.

Thirty-six new 6-room bungalows, the first of an ultimate programme of 96, were completed by Will J. White, in North Toronto, this summer. These bungalows are all detached and of brick construction, and sold at $6,900 each.

Quebec Government to Maintain Highways

A Feature of the New Enactment is Provision for the Maintenance of Provincial and Regional Roads—A Consolidation and Revision of All the Road Acts Passed Since 1912

Not only are provincial highways to be maintained and repaired at the sole expense of the Quebec Government, but regional highways are included in the new highway bill before Quebec Legislature. It will be for Lieutenant-Governor-in-Council to determine what roads shall form part of a provincial highway, add new roads to a provincial highway, to complete or extend it, or change its course, and decide that certain roads or parts of roads shall no longer form part of a provincial highway. There are six provincial highways recognize in the bill whch must be recognized as such by the Government, and it is for the Lieutenant-Governor-in-Council to add to the number as deemed wise. The six highways recognized in the bill as provincial highways are the Montreal-Quebec highway; the King Edward VII. highway, connecting Montreal and Rouses Point; the Sherbrooke-Derby Line; the Levis-Jackson highway; the Chambly highway; the Three Rivers-Grand-'Mere highway. In regard to regional highways it is entirely left to the discretion of the Lieutenant-Governor-in-Council to determine what are regional roads.

In both these classes of main roads, the minister of roads is authorized to carry out the necessary work for maintenance and repair he deems proper, and the government pays the entire cost.

Ten Acts Repealed

The present bill is a complete consolidation and revision of practically all the road acts since the inception of the good roads policy by this province. Ten acts are repealed, including the first law, which is the Good Roads Act of 1912 ,except one sectiin.

None of the important provisions of these laws are repealed, but they are brought into greater conformity. A maintenance and repair of roads bureau was created last sessiin under the direction of a general superintendent. His powers are added to by a clause which gives him power to acquire machines, implements and tools, procure supplies of materials, engage inspectors, patrol men and other employees, and organize maintenance systems by patrol men or other manner. In regard to ordinary roads, the provisions whereby the minister may pay a municipality half the cost for improving a road is maintained, as well as the provision whereby the minister has discretion to grant a special subsidy if he thinks to improve a road is of general interest.

In regard to loans to rural, village or county municipalities for general road building, the old provision of the 1912 act is maintained. Loans for a period of 41 years will be granted by the government at 3 per cent., and the municipality must also provide for the payment of the 41 coupons by means of a special tax on the ratepayers.

It is also provided, as entirely new provisions for provincial roads legislation, that "the minister of roads may cause a provincial highway or a regional highway to be delimited and bounded. He may, for such object, bring changes of boundary in his own name, and exercise all the rights of the municipal corporation owning the road.

"He may, likewise, in his own name, with regard to provincial highways and regional highways, take all actions that a proprietor may.

"No municipal corporation owning a road forming part of a provincial highway or of a regional highway, shall, without the permission of the minister of roads be entitled to close, abolish or dispose of such road or allow any encroachment thereon.

"No municipal corporation shall, without previously obtaining the permission of the minister of roads, make a sidewalk, water course aqueduct, drain or any other work whatsoever in a provincial highway or in a regional highway.

Powers are Great

The general superintendent of the maintenance and repair of roads may, without any formality, fill up in a provincial highway or in a regional highway any excavation which is not authorized by the minister of roads and may demolish any work done without such authorization.

The Quebec Service Commission is given powers to render judgment in certain cases of dispute between owners of land or municipalities and the superintendent of maintenance. These cases are where it is necessary to have access to any land by crossing a provincial highway or regional highway; where it is necessary to run watercourses and conduits under such roads.

In regard to winter roads, it is provided that "balizes" shall not be planted on the paved portion of a provincial highway, a regional highway or an improved road, and the fine is one dollar for each "balize" planted, and also payment of the damage caused. A "balize" is a shrub or piece of other wood planted to show the road in winter time.

The government is authorized to borrow up to forty million dollars for road purposes. This is an increase of five million dollars, the borrowing power having been raised to $35,000,000 last session. Such loans are to be issued for a term of not more than 41 years at a rate of not more than 6 per cent., as before, and the debentures continue to be free of succession duties.

Protection Against Damage to Roads

A new provision of the law provides that "if a person travelling on a provincial highway, a regional highway or an improved road or on a bridge built with the government assistance, infringes any law and injures such highway, road or bridge, or causes damage thereto he may be adjudged, upon suit brought by the minister of roads, to pay for the damage so caused."

Further protection against damages to roads or bridges so built or rebuilt by the government is provided for in the case of line ditches or watercourses. The rural inspector will have power to order the persons bound to maintain such ditches or watercourses to dig, clean and repair them within a reasonable time, and if the work is not done within a reasonable time the inspector shall himself cause it to be done and recover the cost, with twenty per cent. in addition, and the costs, by action in his own name.

These, in the main, are the new and amended provisions regarding roads contained in the new act.

Ventilation Research

Extensive Investigations Concerning the Physiological and Mechanical Phases of the Ventilation Problem

The report of the New York State Commission on Ventilation, to be published by E. P. Dutton & Co., on January first, will consist of two parts, in one volume, the first part dealing with the physiological aspects of ventilation, with a review of the historical developments in the physiological influences of ventilation. The preliminary experiments of the Commission were conducted in a specially designed laboratory at the College of the City of New York, and consisted of fifteen series extending from December, 1913, to January, 1916, in which 113 different persons were used as subjects, these researches aiming to secure answers to the four following questions:

1. What is the effect of the overheating, such as obtains in ordinarily occupied rooms, on the bodily processes and on physical and mental efficiency?
2. What is the actual effect on the body of carbon dioxide, and the chemical substances of expired air?
3. What is the effect of exposure to drafts and to low temperatures and, in particular, what is the relation between previous overheating and subsequent exposure to cold, on respiratory, bacterial infections and on catching cold?
4. What is the actual effect of dry air at high and moderate temperatures? Does dry air harm the membranes of the nose, promote infections and conduce to nervousness?

The Mechanical Side of the Problem

The second part of the report deals with the mechanical phases of ventilation problems and the work upon which this portion of the report is based was carried out in the period from 1915 to early in 1917. Included in this part of the report is a review of the historical development of the art of ventilation and a detailed report of the studies of different methods of schoolroom ventilation, grouped along the following lines:

Method 1. Rooms ventilated entirely through the use of windows.

Method 2. Rooms ventilated through the use of windows, supplemented by the use of an exhaust flue in the room. This type of "exhaust" in which no fan is used for the withdrawal of room air, is known as a "gravity exhaust;" the air finds its own way out through it.

Method 3. Rooms ventilated by means of fans forcing air into the rooms, supplemented by a simple air flue in the room through which air might find its own way out. This is known as "plenum supply, gravity exhaust" system.

Method 4. Rooms ventilated by means of fans forcing air into the rooms being mechanically exhausted through special flues, also by means of fans. This is known as "plenum and exhaust fan" system.

Method. 5. The above Method 4, modified so that the same air was supplied to the room over and over again, after being re-conditioned before it was recirculated.

Experimental Work

The field work undertaken by the Commission included the following:

1. Preliminary experiments in six schools in Springfield and West Springfield, Massachusetts. Fan and window ventilation methods were contrasted.
2. Experiments on five types of schoolroom ventilation in five different school buildings. Typical fan and window ventilation methods were contrasted.
3. Studies in a typical schoolbuilding (Public School 51, Bronx, New York City), in twenty classrooms. The conditions in eleven fan ventilated rooms were compared with those in nine rooms ventilated by means of windows with the use of special types of air deflectors ("window ventilators").
4. Studies in three separate school-buildings in New York City in which window ventilation in three or four rooms was contrasted with fan ventilation in a similar number of rooms in the same building.
5. A special study of Wadleigh High School, New York City, of the comfort and general sensations of the air in two window ventilated rooms and four fan ventilated rooms.
6. An extended research (in co-operation with Dr. S. Josephine Baker, Bureau of Child Hygiene, Department of Health, New York City) on the effect of certain air conditions on respiratory disease among school children.
7. Studies of air distribution and air currents in a specially constructed schoolroom. Upward and downward ventilation and various combinations of air inlets and outlets were compared.
8. An investigation of the value of humidification of schoolroom air, a condition of twenty-eight per cent. saturation being contrasted with one of forty-two per cent.
9. An investigation of the practicability of recirculated air in: (a) the gymnasium at the Y.M.C.A. College, Springfield, Massachusetts; (b) in especially equipped schoolrooms in Minneapolis; and (c) in especially controlled rooms at School 51.

Aside from its practical value as applied to schoolroom ventilation there will be found in this report much material of value to all students of ventilation and to Engineers generally. The subject matter of the investigations carried on under paragraphs 7, 8, and 9, above mentioned, is especially applicable to general ventilation problems.

Effect on Health and Efficiency

The general conclusions regarding the effect on health, comfort, and efficiency, briefly stated are as follows:

Both the physical and the chemical characteriza-

[illegible] affect health and efficiency, but the physical condition of the air, particularly as it relates to its temperature, is the factor of prime importance in practical ventilation.

Harmful effects of overheating have been indicated through measurements of the circulation and body temperature, ability to perform physical work, and through observations on the nasal air passages and susceptibility to disease.

Moderate and high temperatures (75 degrees and 86 degrees) especially when combined with high humidities, tend to interfere with the normal function of heat loss which gives rise to discomfort. A burden is thrown on the heat regulating mechanism with a resulting increase in body temperature, an increase in the rate of breathing, and a fall in the general tone of the circulatory system. Besides, overheating leads to an abnormal reaction of the membranes of the nose, harming them permanently if long continued.

The humidity of air, which is another of its physical characteristics is also of importance in that a high moisture content of the air, especially when the air is warm, mitigates against heat loss through the evaporation of water from the skin. A high humidity will therefore reinforce the harmful action of a high temperature. On the other hand, low humidities, which have been accredited by many with being responsible for all kinds of mischief, have not been found to interfere with comfort, nor have they been found to induce nervousness or irritability.

In but two ways did stale air manifest itself as productive of a real and somewhat immediate effect. As compared with fresh air at the same temperature, vitiated air reduced the performance of physical work. The second and more important effect was on the appetite for food. The appetite was found to be measureably and definitely decreased as a result of breathing stale air. This effect is not to be minimized in view of the probably significant effect on nutrition, which might result from a diminished appetite for food extending over a long period of time.

It is concluded from the experience of other investigations and from the extended researches of the Commission that the primary essential for good ventilation is the maintenance of a proper air temperature of 68 degrees or below, but without the production of chilling drafts. At the same time, there should be an air change sufficient to avoid the accumulation of odoriferous or other substances arising from human occupancy. While the bad effects of stale air in the Commission's experiments were obtained under somewhat extreme conditions (with a concomitant carbon dioxide content of from five to fifteen times that of fresh air), vitiated air cannot be declared free from any harmful effects.

Ventilation by Means of Windows

Some results of the study of ventilation by means of windows may be briefly stated as follows:

The use of windows for ventilating purposes without a suitable means of exhaust for the vitiated air was found wholly impractical. Under these conditions the natural flushing of the room which takes place in milder weather is impeded in colder weather and this results in an accumulation of the products of human exhalation, and a condition of general atmospheric stagnation. The air has high carbon dioxide content and possesses an unattractive odor. The heat accumulates at the ceiling and the floor becomes cold.

The ventilation of the schoolroom by the use of window inlets and gravity exhaust gave much more satisfactory results; indeed the results thus obtained closely approximated those obtained in the fan ventilated rooms studied by the Commission insofar as atmospheric conditions are concerned. The stagnation characteristics of rooms ventilated by windows alone disappear, and although there is less aeration of the room than in the case of the fan ventilated room, this does not tend to produce discomfort or injure the health of the occupants. Difficulties are sometimes experienced from back-drafts, and instances may be found where these are so persistent that shut-off dampers must be provided in the exhaust openings, but where it becomes necessary to use these dampers frequently the window ventilation will be vitiated.

Ventilation by the use of plenum fans and gravity exhaust was found to give better results than any form of window ventilation insofar as the aeration of the room was concerned, but to maintain comfortable conditions, with the volume of air customarily supplied, it was found necessary to maintain a slightly higher temperature than in the case of the window ventilated rooms.

The studies of ventilation by the use of plenum and exhaust fans in combination were not sufficiently extensive to justify conclusions as to the desirability of installing exhaust as well as plenum fans. The exhaust fans have the advantage of maintaining a constant exhaust co-related to the air supply. Such a fan system is more generally applicable to buildings where the local conditions concerning noise, dust, and odor operate against the success of the window ventilating system, or where the plan or method of construction of the building is such as to eliminate the use of the window ventilating system.

Influence of Humidification

Concerning the results of the studies of the humidification of schoolrooms it appears clearly that the observations of the physical and mental conditions of the pupils indicated no material influence of humidification, it being indicated that the air of the humidified rooms was less agreeable as indicated by the opinions of the teachers and observers than the air of the unhumidified rooms, the former being characterized by a more frequent occurrence of odor and stuffiness. There is nothing to indicate that artificial humidification produces any striking improvement in the health or efficiency of school children.

Concerning the use of recirculated air for ventilating purposes this was found entirely satisfactory at the International Y. M. C. A., Springfield, Massachusetts, for ventilating gymnasiums, but when applied to two schoolrooms which had been tightly sealed by means of weather stripping against leakage from external sources it was the subject of constant complaint from odors, lack of "freshness," and tendency to complaints of excessive heat and moisture.

The Commission points out that the nature and environment of the enclosure to be ventilated dictate the method of ventilation to be used, and that what is adequate for one type of building may be inadequate for another. Theatres and auditoria, for example, must generally rely on fan systems. Window ventilation would prove inadequate for a school which is overcrowded and in a noisy and unsanitary district.

HIGHWAYS IN NEW BRUNSWICK

Improved gravel road near Geary, Sunbury County, Fredericton - St John highway.

A gravel road along the seashore, Pocologan-St. John St. Stephen highway.

Improved gravel road near Young's Cove, Queens County, Fredericton - Sussex highway.

Home Building Plan Works Successfully

The Operations of the Northwestern Construction Co. of Winnipeg Have Been Very Satisfactory—A Co-operative Scheme That Has Proved Popular—Descriptions of Two Typical Homes

The home building development of the Northwestern Construction Company Ltd., of Winnipeg, has been very successful during the past season, which is the first year of active operations under the plan. More homes have been erected than the company originally intended. The popularity of the plan is evident from the large number of applications, many of which could not be considered this year, and from the fact that a number of plans and specifications are already in preparation for early construction next season.

All homes are fully modern and are designed and built to the requirements of the owners. The company has its own architectural staff and construction gangs, all the work being done directly under the supervision of the architectural department.

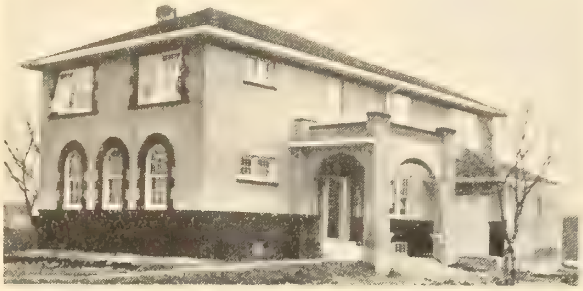


Fig. 1—One of the many homes erected by the Northwestern Construction Co., of Winnipeg. See Figs. 3 and 4 for plans

The building plan, devised by the company in co-operation with the Northwestern Assurance Company, is a new one and offers considerable advantages to the home builder over the usual building plans or loan systems.

When the plans, specifications, and cost of building are approved by the intending owner, a contract is drawn up, the essential points being that the owner makes a cash payment of 25% of the cost of the house and lot; if the owner has a clear title to the lot, the value of this is taken as part of the cash payment. The remaining 75% of the cost is advanced by the Northwestern Trust and Assurance Companies on a first mortgage for a period of ten, fifteen, or twenty years. The payments by the owners to the Assurance Company are made monthly, and cover interest on the loan, municipal taxes, fire insurance, and an insurance premium on the owner's life for an amount equal to the loan, and expiring at the end of the loan period. The insurance premium thus replaces the usual payment of the principal, with the added advantage that in the event of the owner's death occuring at any time during the loan period, the property will be conveyed, free of any further payments, direct to the owner's beneficiary.

The plans reproduced herewith, illustrate two of the residences erected this season. Fig. 3 shows the plan of a residence erected on Wolseley Avenue, Winnipeg. As will be seen from the plan, and photograph Fig. 1, the main entrance is at the side of the house; this was so planned owing to the lot being narrow and of insufficient width to provide for the necessary requirements.

The ground floor contains a living room 13 ft. by 23 ft., dining room 13 ft. by 15 ft. 6 in., inside measurements, also a good sized pantry, and a large hall, containing telephone and coat closets. The dining room and hall are finished in oak, the remainder being finished in pine and enamelled. The staircase and floors throughout are oak, except floor at entrance which is tiled. The living room and dining room have a 15 in. cove plaster cornice. The bedroom floor Fig. 4, contains four good sized bedrooms, a large sleeping porch, glazed and heated ,and a large bathroom with tiled floor, built in bath, shower, foot bath, pedestal lavatory basin, and W.C. The walls of bathroom, kitchen, and basement lavatory are finished in Keen's cement. The bedroom floor also contains commodious closet accommodation and a sewing room, the latter leading to an open balcony over the front entrance porchway. The flooring of the bedroom storey, including the sleeping porch, is also of oak.

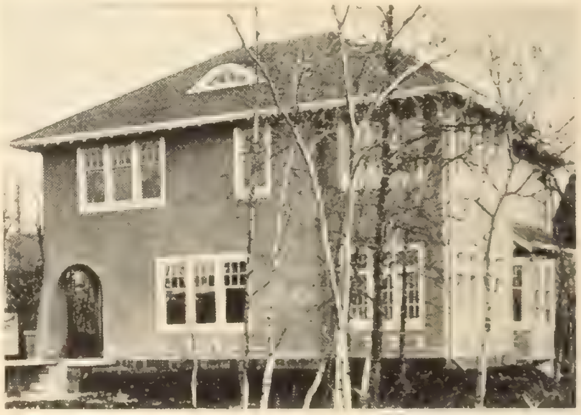
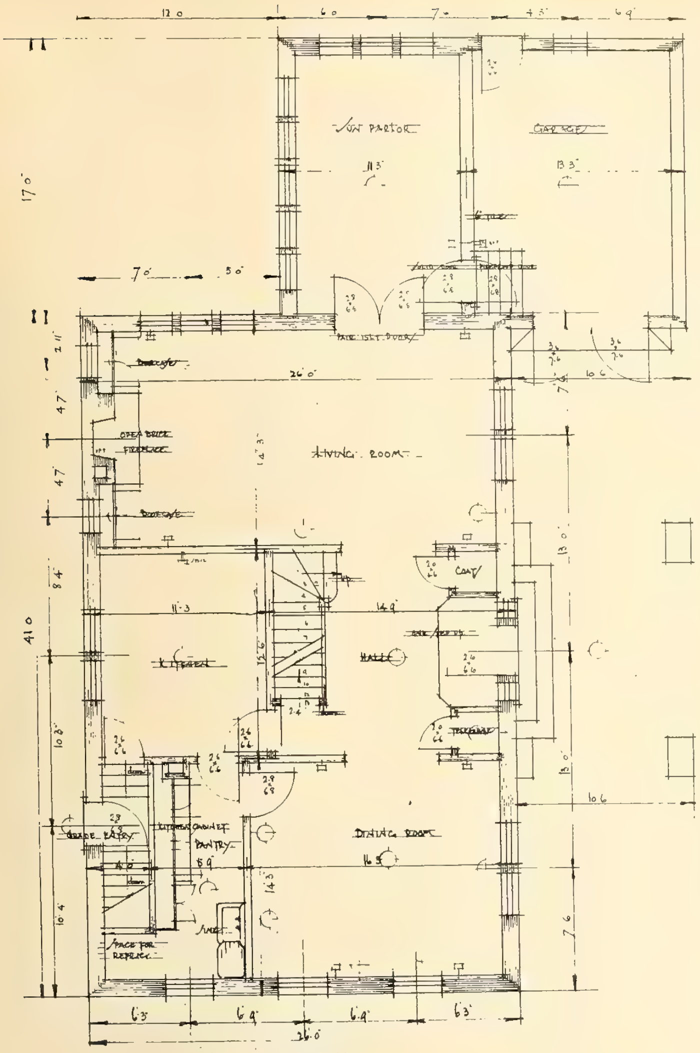
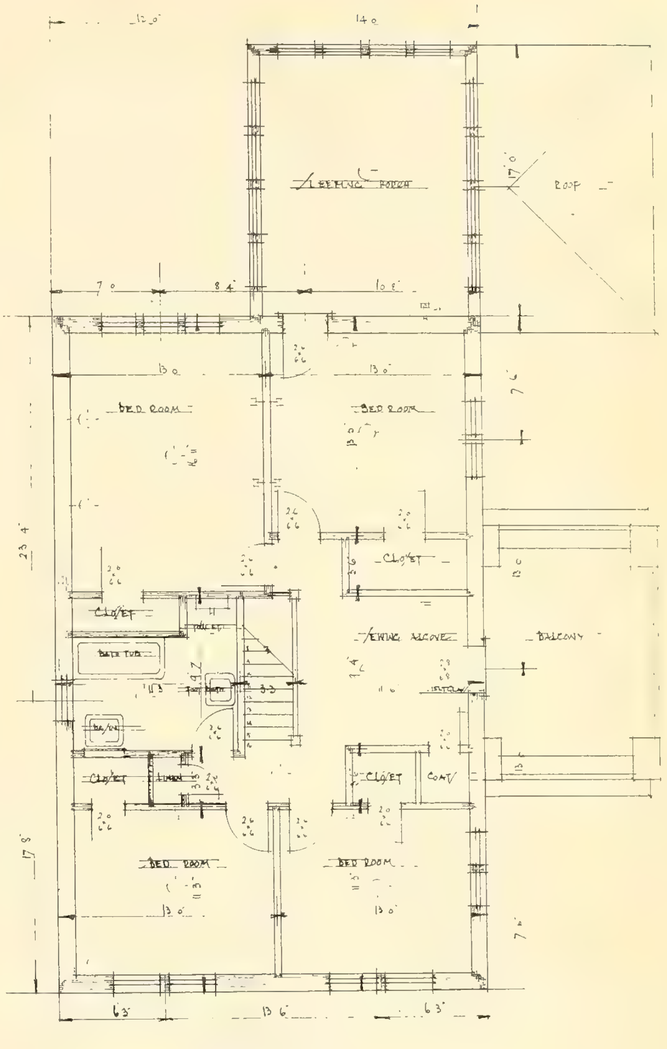


Fig. 2—Another home built by the Northwestern Construction Co. The architect for these residences was M. T. Cantell, L.R.I.B.A.

The outside walls of the basement are concrete 12 in. thick. the inside partition walls of the basement are also of concrete 6 in. thick, these divide the basement into furnace room, coal cellar, laundry, lavatory with tiled floor,

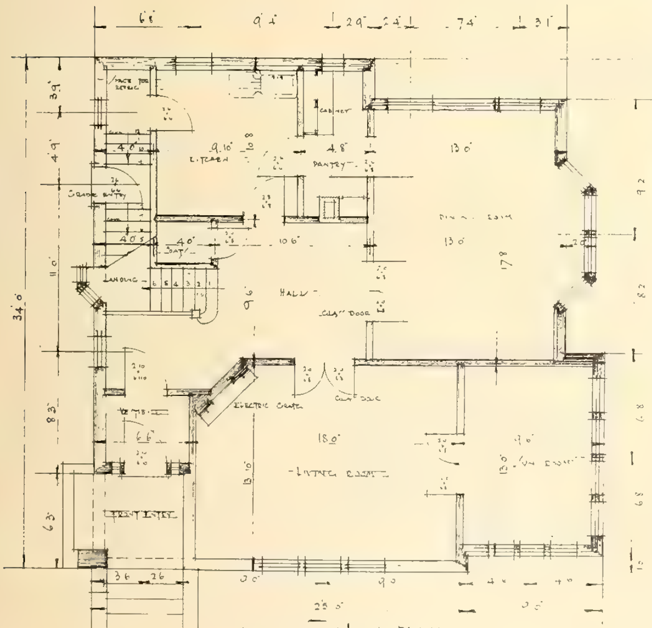


GROUND FLOOR



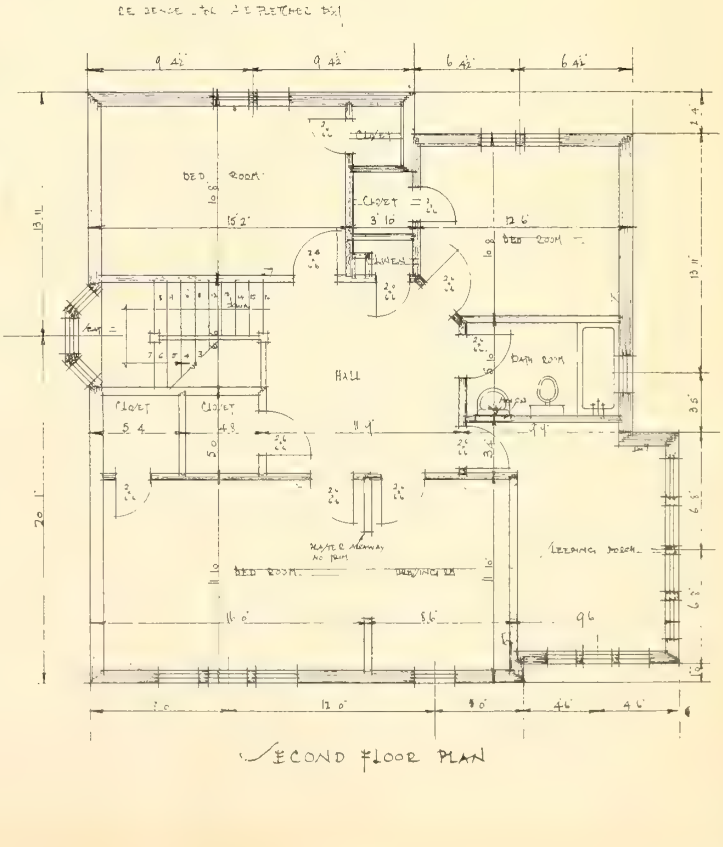
SECOND FLOOR

Figs. 3 and 4—Floor plans of the residence shown in Fig. 1



GROUND FLOOR PLAN

Figs. 5 and 6—Plans of the home illustrated in Fig. 2



SECOND FLOOR PLAN

children's play room 14 ft. by 24 ft. and a storeroom 11 ft. by 15 ft. There is a stairway from the kitchen to the furnace room and a special staircase from the main hall to a central hall in the basement. The external walls above the basement are clay brick outside hollow tile inside, the outside of the basement walls above grade are finished with red Fort William brick with black joints sunk half an inch. The front windows and main entrance doorway are also finished in red brick. The outside above ground floor level is finished in light grey rough cast stucco. The inside of the main walls are backplastered and strapped with 2 by 2, then lathed and plastered. The ceiling just over the bedroom storey is completely covered with half-inch Sealofelt insulation.

The contract price of the residence complete was $13,000.00.

The residence illustrated by Figs. 2, 5 and 6 is erected on Queenston St., River Heights, Winnipeg. The basement partition walls are concrete. Above the basement the house is of frame construction, the outside being covered with one inch shiplap upon which is fixed bishopric stucco board, finished with sand colored stucco. The inside of the outer walls is completely covered with half inch Sealofelt insulation, then 1 by 2 strapping lath and plaster. The whole of the bedroom storey ceiling joists are also covered with Sealofelt insulation.

The upstairs floor and that of the kitchen is maple, the ground storey floor being oak. All woodwork throughout both floors is pine, painted and finished with ivory and white enamel except the staircase which is selected birch, stained and finished mahogany.

The heating system is hot water, the furnace being a seven section Spencer self feed.

The kitchen has a five ft. glazed tile dado with moulded cap, the wall above being finished in Keen's cement.

The bathroom has a tile floor and a dado with Keen's cement above similar to the kitchen, and contains a built-in bath, shower fixture, pedestal wash basin, and W.C. The sunroom and sleeping porch are heated and the walls plastered with sand finish. The whole of the walls throughout the house are decorated with New-Tone flat oil paint in tints to match the furniture of the various rooms.

In the dining room, the bay window is fitted with a box seat and the walls are panelled to a height of 2 ft. 3 in. above the floor. The living room has a 15 in. plaster cove cornice and tapestry brick fireplace fitted with a Magicoal electric fireplace.

As will be seen from the plans, Fig. 5 and 6, the house is designed with a commodious central hall to both floors, affording convenient access to all rooms. Spacious closet accommodation is provided on each floor and various storage rooms in the basement.

The contract price was $11,000.00 exclusive of the lot.

Something New in School Construction

The Daniel McIntyre Collegiate Institute in Winnipeg is a Reflection of the Very Latest Thought in School Design—Provision for Extension as the Necessity Arises

By the Contract Record's Winnipeg Correspondent

The New Daniel McIntyre Collegiate Institute in Winnipeg opens up a new era in public school construction due to economical and political conditions which governed the Board at the time of its inception.

Very often the necessity for academic accommodation is demanded in a district long before the necessity for collegiate or technical education is warranted, and the evolution of a plan which would allow for the construction of the various departments as the necessity arose, was the problem laid before the architect. This was also influenced by the fact that the expenditure of money would be spread over a period without undue strain on the taxpayers in any one year.

As a natural result, the development of the plan resulted in a group of buildings located around a quadrangle and connected by means of a corridor which runs the complete circle of the group. The main member of the group is, of course, the academical section and adjoining this comes the science section, the physical education group, the assembly room and the shop section, the mechanical plant being located in the latter section of the group.

The school is to be in every way a cosmopolitan high school including complete facilities for commercial and vocational subjects as well as the usual preparatory courses for college training. It is planned for twelve hundred day students and its location lends itself to the use of the school for extensive special classes conducted during out of school hours.

The building is constructed of brick and stone with concrete footings and foundations. Its architectural expression has been developed along the lines of Collegiate Gothic. Warm colors and tones have been obtained by the use of Canadian products, including the Fort William tapestry brick and the local buff Tyndall limestone.

It is set in an ample site in a residential section of the city in the west end, the size of the site permitting the placing of full recreation facilities including football fields, tennis courts, etc. The fact of the building being placed in a residential section has influenced the design of building in that it rises, in general, only two storeys in height and does not overpower the surrounding district.

Another interesting feature of the development of this school is the evolution of a new system of construction which has arisen from two causes: first, from an economical standpoint, and second, from the fact that basement rooms are objectionable morally and physically in any school. The building is placed on a system of concrete post and beam construction and in no case is there a single room occupied for class purposes below the ground level, the only accommodation below this level being for mechanical services.

The Academical Building

Provision has been made for class room accommodation in one building which is the centre of the group. It contains twenty-two class rooms, principal's suite and toilet and teachers' accommodation complete for this building.

Science Building

South of the academical building is the science building which contains on the ground floor the general science facilities, and on the second floor the domestic science and household art sections.

Provision is made on the ground floor for two small and two large science rooms, together with two class rooms on the opposite side of the hall looking out upon the quadrangle. Here we have one of the interesting developments resulting from the system of construction. All piping from these various science tables and all duct work and supply in connection with the equipment is exposed beneath the floors where they may be readily repaired and kept in condition. This feature also applies throughout all toilets in this building.

The Physical Training Group

North of the Academical building is the tower entrance to the quadrangle forming the main entrance to the group, and adjoining this is the physical training section of the building.

The Assembly Room

To the west of the gymnasium is the auditorium with a seating capacity of twelve hundred, the accommodation of the school. This auditorium is situated so as to allow for this section of the building to be used for community purposes and being segregated completely from the rest of the group. It is, I think, the intention of the Board, when this part of the building is completed, to make this section a memorial auditorium in memory of the services of public school boys who served overseas.

The Technical Training Group

Between the auditorium and the science group forming the west side of the quadrangle, is the technical educational section. This provides for shop accommodation and draughting room services, containing the following shops: Pattern-making shop, machine shop, blacksmith and tinsmith shop, gas engineering shop, electrical section and erecting shop. The erecting shop is so constructed that a cottage may be built in the shop and taken out of the building. This section of the group is just one storey, shop type, with steel casement sash. Beneath the erecting shop are the mechanical services which are so indicated as to present educational opportunities to those taking the technical instruction.

The total cubical contents of the school are two and one-half million cubic feet. The lowest tender for the completed structure was $788,279.00. However, only a portion of the building is being built at the present time comprising the academical building, science building and half the shops including the mechanical facilities. The contract for this section was awarded to the Sutherland Construction Company, Limited, for $386,800.00 for the general work. The plumbing, heating and ventilating for this section was $68,514.00 and the electric wiring $28,500.00. The architect for the school is J. M. Semmens, 509 Great West Permanent Bldg., Winnipeg, and the general contractor, is Sutherland Construction Co., Ltd., 301-2 Merchants Bank Bldg., Winnipeg.

The Daniel McIntyre Collegiate Institute at Winnipeg, Man.

The Contract Record's

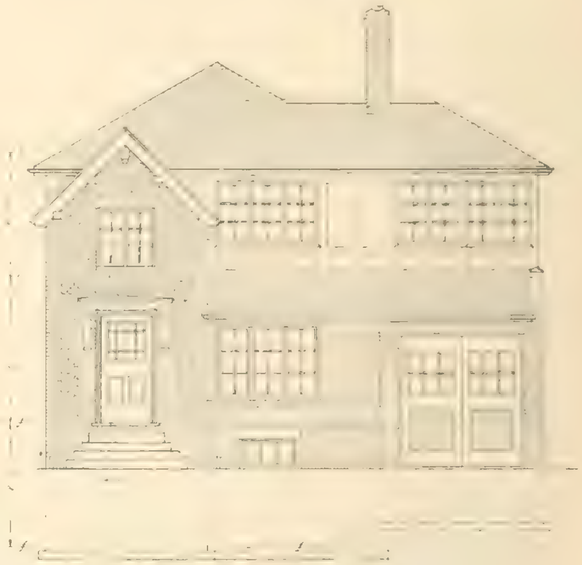
Weekly House Suggestion No. 50

There are many excellent features about the small, well-planned brick residence which we have chosen for the subject of our series this week. Every available foot of floor space has been utilized in the layout of both floors and the whole design is so compact that it is adaptable to a small lot and yet incorporates the features of a modern, better-class home. The exterior construction is in red pressed brick, the main entrance at the front being specially treated. The stucco around the windows on the second floor adds greatly to the smartness of the exterior appearance and the shingle roof is stained a dark green to harmonize with the tone of the brickwork.

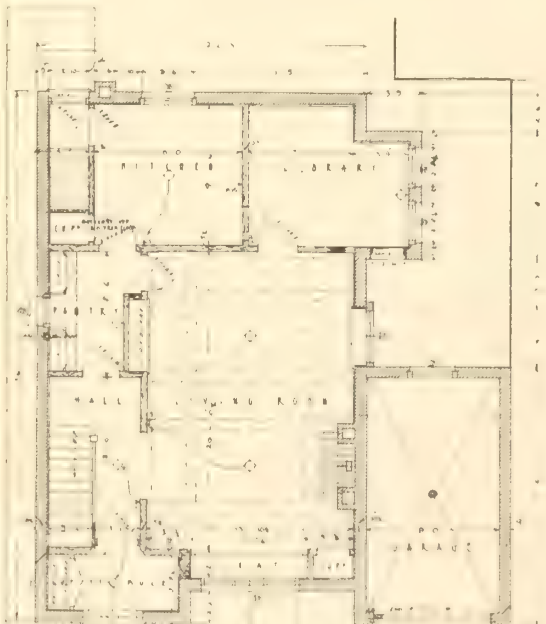
A great deal of the ground floor space is given over to the large living room. This room is trimmed in B.C. fir, including the mantel, and the floors are of quarter cut B.C. fir. Other features are a beam ceiling and a built-in sideboard, both in B.C. fir also. The flooring and trim throughout the balance of the first floor is the same as in the living room, with the exception of the kitchen floor, which is of pine.

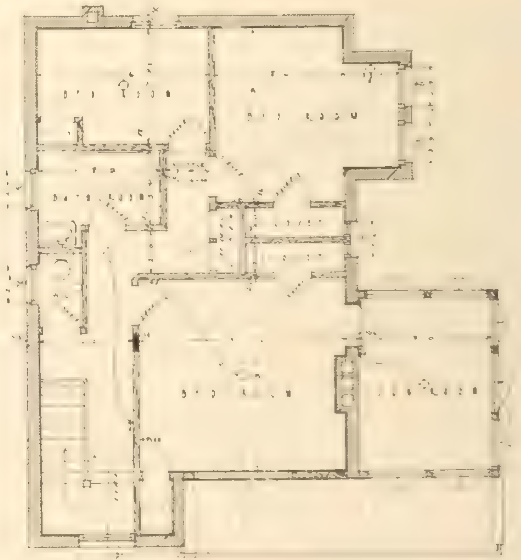
The upstairs layout is not unusual, but it is convenient and all the rooms are well equipped with roomy closet space. The bathroom and toilet have been separated in this plan. The sun room over the garage is laid with a fireproof concrete floor. The trim upstairs is pine, white enamelled, and the flooring is quarter cut B.C. fir as downstairs.

The basement is full size and contains laundry, work shop, furnace room, coal space and W.C. The heating plant is of the hot water type.



This residence is located on Alcorn Ave., Toronto, and was designed by Mr. J. W. Siddall, architect, of the Confederation Life Building, Toronto.





Canadian Link-Belt Catalogs

The Canadian Link-Belt Company are distributing an attractive catalog called "Book No. 567." This is a 28 page production made up in attractive form and thoroughly illustrated on the subject of locomotive cranes. They are also issuing a four page illustrated folder on their crawler crane.

Mainly Constructional

East and West—From Coast to Coast

In spite of weather at 25 below zero, the Ontario Government is continuing road construction work on the highway from Cobalt to South Lorrain. A force of forty men is engaged in an effort to complete the job before the blanket of snow becomes too deep.

A mid-winter meeting of the Canadian Branch of the American Water Works Association will be held on February 22nd and 23rd, at the Carls-Rite Hotel, Toronto. The meeting was arranged by the executive committee which met in Toronto recently. Arrangements are also being made for a display of water works appliances and machinery in connection with the meeting. The official program for the meeting has not been received as yet.

The announcement was recently made by Hon. L. A. Taschereau, Prime Minister of Quebec, that a dam would be built at the Grand Discharge from Lake St. John, the headwaters of the Saguenay River, which would ultimately develop over a million horsepower. A contract between the government and the Quebec Development Company for the building of the dam was recently ratified. The Quebec Development Company is headed by Sir William Price, of Quebec. It is said that work on the dam will be started almost immediately and within two or three years the first part of the project will be completed at a cost of $12,000,000 and will develop 200,000 horsepower. The entire project will be carried to completion later on and is expected to develop over one million horsepower.

A permit was taken out recently for the new addition to the collegiate institute at Galt, Ont., by the contractors, G. H. Thomas & Sons. The permit gives the estimated cost of the work at $311,287. Excavating has been started already.

The losses by fire in the province of Quebec this year will reach over $14,000,000 according to Fire Marshal Leclerc, as compared with $11,000,000 for the year 1921. This is apart from the enormous forest fire losses.

The county system of road-building was finally adopted by the Waterloo County Council in session at Kitchener, Ont., recently. Up to the present, road-building in Waterloo County has been carried on under the township system, but under the new order of things there will be a levy of four and a half mills on the rural municipalities in the county and one and a half mills on the towns and villages. The latter will have to do their own paving inside their limits, in addition to the one and a half mill levy.

A national monument at Ottawa, to commemorate the valorous deeds of Canada's soldiers in the great war, is now being considered by the Government in connection with the preparation of estimates for the coming session of Parliament. It was announced by the Prime Minister recently that an appropriation to meet the cost of the design would be submitted to Parliament for approval, the design itself and the location to be determined later.

Sir Henry Thornton, the new head of the Canadian National Railways, speaking recently with regard to Toronto's new and unused Union Station said that within a short time he would arrange for the heads of the various interests concerned in the new depot to get together and devise some means, even temporary, to enable the public to use the new station by midsummer if possible. This would necessitate bringing the tracks in on the low level. Later on another earnest effort would be made to get the vexed viaduct problem solved.

The ratepayers of North York township, Ont., will, on January 1, vote on a bylaw to expend $125,000 on the installation of a water system to serve the district. The various items included in this plant will be: Dam and rapid-sand and gravel filtration plant, $54,000; pumping machinery, $10,000; 12-in. water mains, $24,000; standpipe, $20,000. The engineers are Messrs. James, Proctor & Redfern of Toronto.

A further debenture issue of $5,000,000 for transportation purposes was authorized by the city council at Toronto recently.

The matter of underground tram lines for the city of Montreal was brought to life again in the city council recently and the Executive Committee has been asked to go into the matter thoroughly. This question was first discussed by the city in 1914. Civic engineers estimate the cost of this work at the present time at close on $1,000,000 a mile.

The Association of Professional Engineers of British Columbia, in annual convention at Vancouver recently, elected the following officers for the year 1923: President, Mr. A. E. Foreman, district engineer for the Portland Cement Association; vice-president, Mr. Charles Brakenridge; executive committee, Messrs. P. Philip, F. W. Guernzey, Frank Sawford, H. L. Robertson and D. O. Lewis.

Personal

Mr. H. L. Seymour, member of the engineering firm of Frank Barber & Associates, Ltd., of Toronto, and specialist in town planning, has been appointed special lecturer on town planning at the Faculty of Applied Science, University of Toronto, for the Easter term of 1923.

An excellent illustrated address was given by Mr. George F. Porter, chief engineer of the Walkerville Bridge Co., of Walkerville., Ont., before a recent meeting of the London Branch of the Engineering Institute of Canada. Mr. Porter's subject was "Bridge Construction" and he illustrated and explained many construction features of some of Canada's largest bridges, referring particularly to the Quebec bridge.

James McAdam, A.M.E.I.C., of Frank Barber and Associates, Limited, left recently for the Old Country. Mr. McAdam has had charge of the highway department of the firm for several years. He is combining business with pleasure as he intends associating himelf when on his winter vacation with the Board of Transportation for Great Britain, on reconstruction of county highways.

Mr. E. G. Ryley, formerly manager of Western Branches of the Trussed Concrete Steel Company of Canada, Limited, has been appointed manager of the Toronto Branch of that Company with offices at 34 King Street, West, Toronto.

Trade Incorporations

Stuart Bros. Ltd., 3 Hyde Park Ave., Hamilton, Ont., capital $40,000, to take over the general contracting and engineering business of Stuart Bros.

The Crowland Brick & Tile Company, Ltd., with head office at Welland, Ont., capital $40,000, to manufacture brick tile, terra cotta, etc.

CONSTRUCTIONAL ACTIVITY

Period of Dec. 27, 1922 to Jan. 2, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Brantford, Ont.
Expansion [illegible] Belleview Pumping Station costing [illegible] has commenced. Tenders will be called Mar. 1st for machinery. F. Adams, engineer, buys all material & equipment.

Hamilton, Ont.
City Council will call for tenders on storm sewers shortly. E. R. Gray, engineer. S. H. Kent, clerk.

Hamilton City Council contemplates storm sewer on Cope St. E. R. Gray, engineer

Kincardine, Ont.
Town Council contemplates the installation of an auxiliary gasoline waterworks pump at cost of $7,000. Clerk, J. H. Scougall.

Montreal, Que.
City Council contemplates a sewer on Eadie St. Engineer, S. Fortin.

North Vancouver, B. C.
Plans are being prepared for $39,000 waterworks extension. By-laws passed G. H. Morden, mayor.

The District of North Vancouver is having plans prepared for extensions to reservoir at cost of $11,500. Tenders will be called soon.

St. Etienne De Gras, Que.
Contracts for carpentering, reinforced concreteing, brickwork & steel for $7,000,000 power plant of Shawinigan Power Co. Ltd., are not yet let.

St. Therese De Blainville, Que.
Plans are being prepared and tenders will probably be called for in April by the Town Council for sewers. S. Ouimet, 76 Gabriel St., Montreal, engineer.

Scarboro Twp., Ont.
Scarboro Public Utilities Commission is receiving tenders for watermains until Jan. 15. Secretary, W. D. Annis, Birchcliffe, Ont. Engineers, James, Proctor & Redfern Ltd., Toronto St., Toronto.

Toronto, Ont.
Tenders for sewers in the Wychwood district are being received by City Council until Jan. 16, 1923.

CONTRACTS AWARDED

Becancourt, Que.
Contract for 5 miles waterbound macadam road for Provincial Department of Highways, awarded to Cie de Construction de St. Nicolet, Nicolet, Que. Cost is $83,643.

Gentilly, Que.
A. Heon & Cie, 45 St. Antoine St., Three Rivers, has contract for 8 miles of macadam pavement. Steam rollers, stone crushers and dump carts required. Road will cost about $176,000. A. Fraser, engineer.

Hamilton, Ont.
Cope & Sons, 29 Albert St., have the general contract for sewers costing $29,430. E. R. Gray, engineer.

Loretteville Village, Que.
Langaniere, Houde & Cie, Grondines, Que., are repairing provincial highways at cost of $17,220.

Nicolet, Que.
La Cie Construction Nicolet has the general contract for Levis-St. Lambert highway costing $84,000.

St. Edouard De Gentilly, Que.
A. Heon & Cie, Three Rivers, Que., have the contract for 8 miles of waterbound macadam roadways for the Provincial Government, costing $169,182.

St. Croix, Que.
Ulderic Paris, Deschaillons, Que., has the contract for roadway costing $139,959 for the Provincial Government, Department of Highways. G. Henry, engineer.

St. Nicholas, Que.
Provincial Government has awarded T. E. Rousseau, St. Valier St., Quebec, contract for macadam highway costing $117,394.

Railroads, Bridges and Wharves

Province of Ontario.
Tenders are wanted by the Provincial Department of Highways until Jan. 18 for the erection and placing of a crib around one pier of the Provincial Highway bridge across the Bay of Quinte. Deputy Minister, W. A. McLean, Parliament Buildings, Toronto.

CONTRACTS AWARDED

Nelson, B. C.
Provincial Government has awarded Rawlings & Labrache, Nakusp, B. C., contract for timber bridge at $6,150, near Nelson, B. C.

North Vancouver, B. C.
Plans for $1,250,000 bridge over second narrows to be forwarded to Marine Department at Ottawa for approval. General conctractors, Northern Construction Co., & J. W. Stewart & Co., Vancouver, B. C.

St. Sauveur Parish, Que.
Town Council has awarded Armand Sicotte & Cie, Davaar St., Outremont, Que., contract for $12,000 reinforced concrete arch bridge 35 ft. long.

Shawbridge Parish, Que.
Armand Sicotte & Cie, 745 Davaar Ave., Outremont, have been awarded the contract for $22,000 steel & concrete bridge. I. E. Vallee, Parliament Bldgs., Que., engineer.

Public Buildings, Churches and Schools

Cyrville, Ont.
Tenders are being received by Rev. Father Duprey, Cyrville, until Mar. 1st., for $140,000 church.

Hamilton, Ont.
Plans are being prepared and tenders will be called for soon for wiring of the home for aged and infirm in Hamilton. E. R. Gray, engineer. S. H. Kent, clerk.

Tenders will be called for soon for the wiring of Hamilton City Hall. E. R. Gray, engineer.

Lennoxville, Que.
Board contemplates a school. Rev. J. A. Parent, secretary.

London, Ont.
Plans are to be prepared for an $100,000 addition to St. Joseph's Hospital. Architects, Watt & Blackwell, Bank of Toronto, London, Ont.

Lotbiniere, Que.
Donat Beaudet is secretary of Lotbiniere School Board, which contemplates a school of frame construction.

Merriton, Ont.
Town Council is having plans perpared for a public library costing $10,000. Arch. Nicholson & Macbeth, St. Catharines, Ont. All trades to be let and no materials yet purchased.

Montreal, Que.
Separate tenders on $3,000,000 Police Courts being received by Hon. A. Galipeault, Parliament Bldgs., Que., until Jan. 18.

Point Grey, B. C.
Tenders wanted for $4,000 Boy Scout Hall. Sharp & Thompson, London Bldg., architects. Chairman of building committee is Geo. Walkem.

Quebec, Que.
Plans are being prepared for a new Industrial Palace for the Quebec Provincial Exhibition Commission. Arch. D. H. Cote, 4 Cremazie St. Sec. Geo. Morissette, City Hall. Cost estimated at $125,000.

St. Anne Des Monts, Que.
Les Syndics, St. Anne de Monts want prices on galvanized iron, sash & doors, painting, glass, oil & paint for new $160,000 church. General contractor is Jos. Collins, Riviere de Loup.

St. Damase, Que.
Parish is making a $3,000 addition to presbytery. Parish priest, Rev. A. Richard.

St. Eloi De Temiscouata, Que.
R. C. parish will erect a church at cost of $60,000. Pierre Levesque, architect, 115 St. John St., Quebec, Que.

St. Severin, Que.
School Board contemplates a school

of concrete construction. A. Lachance, secretary.

Toronto, Ont.
Plans are being prepared by the Board of Education for additions to Runnymede and Earl Haig Schools. Secretary-treasurer, W. W. Pearse, 155 College St., Toronto.

North Broadview Pres. Church contemplates the erection of a new edifice at the corner of Broadview & Dearbourne Aves. John MacLean, 1204 Danforth Ave., and W. N. Reid, 127 Arundel Ave., members of building committee.

Toronto Transportation Commission is calling for tenders, closing Jan 18, for repair shops & storehouse to cost about $1,200,000.

CONTRACTS AWARDED

Benmiller, Ont.
Munroy Bros., Blyth, have contract for steam heating plant for $15,000 school to be erected in spring by Benmiller Public School Board.

Brantford, Ont.
Contracts for work on the "Mohawk" Institute have been awarded as follows: Roofing & sheet metal, Brown & Jarvis, Brantford; electrical, plumbing & heating, Anguish & Whitefield, Brantford; plastering, Hewson & Potter; painting, Frank McQuillan; marble & tile, Kent, Garvin & Co., Hamilton, Ont.

Erindale, Ont.
General contractor, A. Berrill, Streetsville, Ont., will buy slate blackboards for Erindale Public School. Contract for sheet metal, heating, plumbing & wiring let to Jas McMahon, Port Credit.

London, Ont.
Alex. Milne, 198 Emery St., London, has the heating contract for Salvation Army Citadel costing $5,000.

Montreal, Que.
Metal Shingle & Siding Co. 91½ Delorime Ave. have roofing, sheet metal, steel sash and waterproofing contracts for $80,000 District Control Bldg. Vincent & Say Electric Co., Union Ave., have the electrical contract.

Repairs to Montreal University are in progress and contracts have been awarded as follows: General contractor, Alf. Mercure & Fils; steel, Pheonix Bridge & Iron Works; metal lath, E. Dussault.

Contracts for shelter buildings in Monarch park have been let as follows: Carpentery & masonry, T. Painter, Huron St.; plumbing, R. Jordan, Haselton Ave.; painting, R. Johnston, Galley Ave.

Toronto, Ont.
Board of Education has let contracts for work on Earlscourt School as follows: Masonry, H. Lucas & Son, Toronto; heating, maintenance dept. of the Board; plastering, R. C. Dancy, Kendal Ave.

Bennett & Wright, Toronto, have the electrical contract for Memorial Tower being erected by University of Toronto. Faircloth & Winfield Ltd., have the painting contract.

Francis Hankin & Co., 386 King St. W., Toronto, have the general contract for $203,000 incinerator plant being erected by the city.

St. Tite, Que.
Seats, desks, blinds & blackboards for $37,000 college at St. Tite supplied by F. W. Vilas, Cowansville.

Wallaceburg, Ont.
The following contracts for $63,000 school at Wallaceburg, Ont., have been let. Roofing, Turnbull & Cutliffe, Brantford, Ont.; electrical, Harris & Marson, Toronto; plastering, Hewson & Potter, Brantford, Ont.

Winnipeg, Man.
Dominion Government will make alterations to Post Office Building at cost of $4,000. General contracts awarded to Wyatt-Ireland, Ltd., Winnipeg Man.

Business Buildings and Industrial Plants

Davis, Sask.
Searle Grain Co. Ltd., 389 Grain Exchange, Winnipeg, Man., will rebuild elevator recently destroyed by fire. Cost will be $12,000.

Ford City, Ont.
Until January 2, 1923 Albert Kahn will receive tenders, c/o Ford Motor Car Co., Ford City, for plumbing and heating for new $1,500,000 shops at Ford Ont.

London, Ont.
J. A. Nash is having plans prepared for an addition to store at cost of $15,000.

B. F. Brighton, 479 Emery St., contemplates the erection of a bake shop costing $20,000.

Montreal, Que.
Prices wanted at once on 8-9,000 gallon compression tanks by Frank C. Woodroffe, purchasing agent, for addition to store and heating plant. Henry Morgan, general contractors.

Davis, Goodman, St. John St., Montreal, are preparing plans for 2 stores & 4 flats for Z. Fineburg. Tenders will probably be called for about the middle of February.

New Westminster, B. C.
Triangle Chemical Co. Ltd., is preparing plans for an iron oxide factory to cost $25,000.

St. Charles De Caplan, Que.
Stores and flats costing $6,000 are contemplated by Jas Ferlotte. Work will proceed in spring.

J. E. Gagnon, St. Bonaventure, Que., contemplates erection of 2 stores.

Saskatoon, Sask.
Saskatoon Hardware Co. Ltd., is having plans prepared for store and offices F. P. Martin, architect.

Stratford, Ont.
Tenders are wanted for addition to factory of Stratford Mfg. Co., King St. W., by Chas. Moore, manager. Tenders being received for masonry, carpentery, roofing, electrical & heating. No closing date set.

Sussex, N. B.
Walter S. Fairweather will wreck building on site at present and erect a new store in the spring.

Toronto, Ont.
Roofing and electrical contracts for $20,000 store being erected by Loblaws Groceteria Ltd., will be let shortly. Mr. Shields, c/o owner, building supt.

Vancouver, B. C.
Woodward Department Stores Ltd., want tenders for $150,000 addition to building. Architect, W. T. Whiteway, 1406 Dominion Bank Bldg. Tenders will be received until Jan. 15.

West St. John, N. B.
Canadian Pacific Rly. contemplates repairs to grain elevator damaged by dust explosion.

Weston, Ont.
W. J. Sutton, 2912 Dundas St. W., has secured site for store with apartments. Work to start in spring.

Winnipeg, Man.
Swift Canadian Co., will start work soon on $12,000 fertilizer plant.

CONTRACTS AWARDED

Brantford, Ont.
Brantford Roofing Co., are making alterations to their factory costing $6,000. Schultz Bros., of Brantford have the general contract and Dominion Bridge Co., Toronto the contract for steel.

London, Ont.
Wilson & Son, have the contract for $25,000 store for Grafton Clothing Co., of Dundas, Ont.

Montreal, Que.
J. Torali has the contract for excavating for $50,000 plant for A. T. Stewart Co. Ltd. Arch. Woodman & Cubbidge, Winnipeg, Man. General contractor, Richard Ryan, 34 St. Martin St., Montreal.

Outremont, Que.
Contracts for 4 stores and 8 flats being built by F. Trudeau, 2410 Hutchison St., are awarded as follows: H. Truchan, electrical; A. Normand, plastering; Dussard, Mongeau & Joly, St. Catherine St., tiling, R. Charbonneau, achitect.

Toronto, Ont.
A. W. Carmichael Ltd., Palmerston Ave., has roofing and sheet metal contract for $15,000 service station being built for Imperial Oil Co., by J. V. Gray Construction Co.

Contracts for George McIntyre's $9,000 factory let as follows: Brickwork, T. Burgham; carpentering, Ed. Gonyeau; steel, Toronto Steel Construction, King St., E.

S. Robertson, Clendenan Ave., has roofing contract for Howard Furnace Co.'s $24,000 factory.

Toronto Electric Co., Duke St., have the electrical contract for wiring the addition to Muir Cap Co.'s factory.

Foundations are going in for store and apartment to cost $7,500, and all trades let. Masonry, J. Copp, 31 Balmoral Ave.; roofing, Bell Bros., 43 Pinewood Ave.

Consolidated Plate Glass Co. of Canada Ltd., has the glazing contract for B. P. Foster's store and apartment.

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

Tenders Wanted

Tenders in bulk, for all trades (except Me- [illegible] will be received by the undersigned until 5 P.M. on **Monday the 15th inst.,** for the erection and completion of St. Martin's Church, Ennismore, in the Diocese of Peterborough. Plans and specifications may be seen at the office of the Architect and also at St. Peter's Rectory, Peterborough. The lowest or any tender not necessarily accepted.

ARTHUR W. HOLMES, Architect,
1 79 St. Joseph St., Toronto.

Second Extension of Time

Notice is hereby given that the time for the reception of tenders for the Esquimalt, B. C. Dry Dock Machinery, is further extended to **Thursday, February 15, 1923.**

By order,
R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, December 28, 1922. 1

TOWNSHIP OF YORK

WATERMAINS

Sealed tenders, plainly marked as to contents, will be received by the undersigned up till 12 o'clock noon, **Saturday, Jan. 13th, 1922,** for the construction of the following works in the Township of York

WATERMAINS

1. Alameda Avenue
2. Eglinton Avenue
3. Gray Avenue
4. Larratt Avenue
5. Cheyne Avenue
6. Kennedy Avenue
7. Hamstead Avenue

Plans and specifications may be seen at the office of the undersigned, 40 Jarvis Street, Toronto.

The lowest or any tender will not necessarily be accepted.

FRANK BARBER,
Township Engineer.
FRANK BARBER AND ASSOCIATES LTD.,
Consulting Engineers,
40 Jarvis Street,
Toronto.
Toronto, December 8th, 1922. 1

Book-Keeper:—Wanted a competent man who has had experience in railroad construction accounting. Apply to box 63, Contract Record, 52

RATES

20 cents per agate line (14 lines to the inch) Positions Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

Toronto Transportation Commission

TENDERS

Sealed tenders will be received for the construction of the following buildings situated at Bathurst Street and Davenport Road, Toronto.

A. General repair shops of brick and steel construction, comprising main building, boiler house and subsidiary buildings, and including excavation, concrete, structural steel, masonry, plumbing, heating and ventilating, electric wiring, automatic sprinklers, outside fire protection and all other work required for the completion of the building.

B. General stores building of reinforced concrete construction, and including all excavation, concrete, masonry, plumbing, heating and ventilating, electric wiring and automatic sprinklers, and all other work required for the completion of the building.

Tenders will be received for the buildings shown under headings "A" and "B" separately or for the work under both headings together. Tenders must cover all of the work contemplated under each heading.

All tenders are to be endorsed "Tender for general repair shops" and or "General stores building" as the case may be, and are to be addressed to the Chairman of the Toronto Transportation Commission and must be delivered to the offices of the Commission, 5th Floor, Public Utilities Building, 35 Yonge Street, not later than twelve noon on **Thursday, January 18th, 1923.**

Each tender must be on the Commissioner's Form of Tender and must be accompanied by an accepted Bank Cheque payable to the Toronto Transportation Commission for two and one half per cent (2½%) of the amount of the tender.

Plans and specifications, Forms of Tender, and instructions to bidders may be had on application to the Commissions Building Department, Third Floor, Public Utilities Building, Toronto, on and after **Tuesday, January 2nd, 1923.**

The lowest or any tender not necessarily accepted

H. H. COUZENS,
General Manager,
1 Toronto Transportation Commission.

Civil and Electrical Engineer

Applications will be received by undersigned up to January 15th, 1923, for positions of Civil and Electrical Engineer, separate or combined, for city of Prince Rupert, B. C. Duties to commence February 2nd, 1923. State qualifications and salary required and give references.

Combined duties will include superintendence of light, telephone, and water systems, and also those of City Engineer.

ERNEST A. WOODS,
52 City Clerk.

Notice to Contractors

Kingston Suburban Roads Commission

DEVIATION OF THE BATH ROAD, COLLINS BAY PROPOSED CAUSEWAY

Competitive bids wanted for:—
(1) Rock Fill.
(2) Concrete Bridge and Rock Fill.

Sealed Tenders, addressed to A. H. Muir, Secretary to the Kingston Suburban Roads Commission, City Hall, Kingston and marked "Tenders for Causeway" will be received up to 5 o'clock P.M., the **22nd day of January, 1923.** for the construction of a Causeway.

Plans, specifications and form of tender may be seen at the office of the undersigned.

The Commission does not bind itself to accept the lowest or any tender.

A. M. RANKIN,
Chairman of the Commission.
R. H. FAIR,
County Road Superintendent.
Kingston, 30th. Dec. 1922. 1-2

STEEL PILING

1,000 tons 40 ft. long
14" x ⅜" and 7" x ¼"
Already to Load
UNIVERSAL EQUIPMENT CO.,
1-T.f. Niagara Falls.

Scarboro Public Utility Commission

Water Area No. 2

Tenders

For Laying Watermain

Tenders properly marked and sealed, addressed to Mr. W. D. Annis, Secretary of the Commission will be received up to 5 p.m., **Monday, January 15th., 1923,** for the labor involved in laying approximately the following quantity of watermain:-

5500 feet of 12"
12000 feet of 8"
14000 feet of 6"

It is the intention of the Commission to prosecute this work throughout the winter.

Plans, specifications and all details may be obtained at the office of the Engineers or Commission.

JAMES PROCTOR & REDFERN, LTD.,
Consulting Engineers,
36 Toronto St.,
Toronto.
R. M. CROKER,
Reeve & Chairman.
W. D. ANNIS,
52-1 Sec'y., Birchcliffe, Ont.

To contractors or municipalities and executives: —Wanted—position as superintendent or foreman, by married man; 30 years' practical experience mining, mechanical and construction engineering, tunnel, roads and bridges, installing, moving and repairing machinery; have handled men and material in many parts of the world; A1 mechanic; willing to go anywhere or do anything. F. J. M. Blackham, 285 North Cumberland Street, Port Arthur, Ontario. **47-2**

Heating contract let to George Moore, 3215 Yonge St.

Residences

Arran Twp., Ont.
Geo. Barclay, R.R. No. 1 Tara, will rebuild $5,000 residence destroyed by fire.

Brantford, Ont.
Lloyd Dymond, 21 Maple Ave. is having plans for a $15,000 residence prepared by F. W. Nicholls, Temple Bldg., Brantford.

Curloss Twp., Ont.
Wm. McCrae, R.R. No. 3 Wingham, Ont., will rebuild $12,000 residence and stock barn destroyed by fire. Interested in prices of materials.

Grimsby, Ont.
Jas. A. Wray, Grimsby East, contemplates building a $4,000 residence.

Hamilton, Ont.
In the spring Seymour & Holloran will build a $4,500 brick residence.

R. Guy, Garfield Ave., contemplates a $5,000 residence in Grovenor Ave. Work will start in spring.

Two residences costing $8,000 will be built in the spring by F. Beldman in Paisley Gdns.

F. Belmont, 31 Belmont St. contemplates a $4,000 residence. Work will start in the spring.

R. Guy, 15 Garfield Ave. will build a $5,000 bungalow in the spring.

W. J. Sheridan, 261 John St., contemplates the erection of several brick residences.

Seymour & Holloran, 60 Spadina Ave., are erecting a $4,500 brick residence.

J. N. Fitzgerald contemplates the erection of several residences in Woodlawn, McKittrick Survey. Work will start in spring. Address c/o McLaughlin Motor Co., Bay St. S.

Chas. Berry, 18 Setven St., will start work in spring on 3 brick residences.

In the spring J. Goatley will commence 5 residences of brick construction.

John Slack, 38 East Bend Ave. N., contemplates building residences in the spring.

J. Ireland, 70 Belleview Ave N. will start work shortly on 2 residences costing $9,000.

Hamilton Home Builders contemplate a residence in Eastholme Survey early in the spring.

Herbert Emery, 124 Grosvenor St. south, will build three residences costing $18,000. Work will commence about March 1.

London, Ont.
E. A. Seabrook, 83 Elmwood Ave., is having plans prepared for 2 residences costing $7,000. Work will proceed in spring.

Webster Construction Co. is excavating a residence costing $3,500.

Thos. Janes, 111 High St., contemplates the erection of two residences at cost of $11,000.

Montreal, Que.
J. Nutt, 106 City Councillors St., contemplates 4 residences costing $45,000. Work will start in spring.

J. Brown, general contractor, 4263 St. Catharine St. W., is receiving prices on tiling, roofing, electrical, plumbing, heating, plastering, & millwork, for residence in Montreal.

Pizagalli's Tile Mfg., 61 Baby St., have tile contract for $50,000 residence remodelled to an apartment house. Alex. McKay, 498 Argyle St., general contractor.

Outremont, Que.
Tenders will be called for sub trades for work on 3 residences costing $18,000. Work temporarily suspended. General Contractor, J. C. Julien, 783 Lacombe St.

Plantagenet, Ont.
X. Provost, Plantagenet, contemplates a residence costing $3,500.

St. Catharines, Ont.
H. Colton, 54 Albert St., is erecting a frame house on concrete foundation, costing $4,000.

St. Mary's Ont.
Plans are being prepared for a $7,000 residence for Dr. P. F. Coupland.

Sandwich, Ont.
Two residences costing $4,500 are being erected by Wm. Gray, 243 Mill St. All sub trades to be let.

Three Rivers, Que.
Tenders will probably be called for about Jan. 15, for $10,000 residence for Hon. J. A. Tessier. Architect Jules Caron, 21 St. Joseph St.

Toronto, Ont.
Work will start shortly on $15,000 residence being built by A. E. Cuff, 118 Delaware Ave., Toronto.

A. W. Blaheman, Lansing P.O., is building a $10,000 residence in North Toronto.

Frank Martin, 1392 Queen St. E., has excavated for a $7,000 residence.

J. Ryan, 79 Castle Frank Road, contemplates a duplex house costing $8,000.

Topple & McDonagh, 125 Eglinton Ave., are building a $15,000 residence. Plastering, painting, heating, wiring and plumbing contracts to be let.

H. J. Fennell, 250 Eglinton Ave., contemplates a pair of houses costing $6,000. Tenders being received on all trades.

P. Clements, 32 Marmot Ave., is building a residence at cost of $5,000.

W. E. Taylor, 22 Falcon Ave., contemplates erection of pair of houses costing $7,000.

Mitchell & Shepperd, 502 Palmerston Ave., are erecting a $5,000 residence on Eglinton Ave.

J. Hurst is building a $6,000 residence on Nairn Ave.

W. Roberts, 7 Runnymede Rd., contemplates a residence on Baby Point Cres.

A pair of residences costing $8,000 are being built by Geo. Groves, 450 Concord Ave. Two storeys brick construction.

Foundations are going in for E. Grainger's $5,000 residence in North Toronto. T. T. Bonner is the builder.

Tenders for masonry, painting, heating, plastering and electrical work on $15,000 residence and garage being received by Albert E. Cuff, 118 Delaware Ave., owner and E. Leigh, 34 Balsam Ave., architect.

Morris Dennis has purchased the site in Runnymede district for 12 residences. D. H. Burnham, 260 Lauder Ave., will probably be the architect.

Tenders are being received on all trades by A. A. Hassard, 73 Harris Ave., who contemplates 4 detached residences.

Geo. A. Clark is building 2 residences costing $8,000 each for J. A. Kennedy, 186 Northcliffe Blvd. D. H. Burnham, 260 Lauder Ave., is the architect.

A. Semple, 57 Helendale Ave., is building a $7,000 residence in North Toronto.

W. H. Head, L. Skipper Ave., has the foundations in for a pair of residences costing $7,000.

Truro, N.S.
J. N. Kenny, has not yet purchased roofing and furnace for $4,500 residence or let heating and plumbing contracts.

J. H. Bryson is erecting residences costing $4,000. Interior trim not yet purchased.

Verdun, Que.
Ross Realty Co. Ltd., 17 St. John St., have excavated for 3 pr. semi-detached residences of solid brick costing $25,000.

Victoria, B.C.
Plans are being prepared by Hubert Savage, Sayward Bldg., for $5,000 residence for W. Allward.

Edward Janes is having plans prepared by A. C. Ralfs, 151 Lotus St., for frame bungalow to cost about $5,000.

Windsor, Ont.
Peter Osterhout is building a $4,000 residence. All work is by day labor.

Leslie Brown, 1059 Howard St., has excavated for a $4,00 residence.

$6,000 residence being erected by Wm. Burnell. S. C. Bradshaw, 419 Gladstone Ave., general contractor. Lumber and roofing only material purchased.

CONTRACTS AWARDED

Lachine, Que.
J. Theoret, Lachine, is the general contractor for 2 pr. semi-detached residences.

Ottawa, Ont.
Contracts for double residences being erected by F. Robillard, 73 Preston St., are: electrical, Marchand Electric Co., Bank National Bldg; plumbing and heating, J. Lafreniere, Somerset St.

Contracts for $7,000 residence being built by Philip Weisher, 44 Bethany St., let as follows. heating, W. J. Phillips, Wellington St.; plumbing, W. Tapp, Armstrong St.

A. L. Heath, Westboro has the heating contract and Mr. McEvoy the plumbing contract for $6,500 residence being built by A. L. McDonald, 107 Caroline St.

Outremont, Que.
F. Themens is building 2 residences costing $18,000 for which following contracts have been awarded. Elec-

trical, J. J. Valdis, 444 Dorchester St.. Plastering, J. Galonier, Ahuntsic; Painting, Jas. Semard; Tiling, Dussard, Mongeau & Joly, St. Catharine St. E.

Following contracts for $55,000 residence being built by J. C. Julien have been awarded; electrical, J. Ortiz & Co., 1395 Bordeaux St.; plastering, J. Quensel, St. Laurent; painting, Jos. Laurent, 1104 Valier St.

P. P. Boileau, 625 Champagnean St., has let contracts for $14,000 cottage as follows: Roofing, Lalande & Dubeau, 1209 Van Horne Ave.; electrical, Acme Electric Co., L012 a Laurier W.; plumbing, A. Mathiey & Co., 74 Viateur St. W.

Toronto, Ont.
The following contracts for W, J. Brown's $6,000 residence on Roehampton Ave., have been let; heating Geo. Moore, 3215 Yonge St.; plastering, A. R. Feast, 66 Runnymede Rd.; general contractor J. Allan, 30 Castlefield Ave.

Contracts for 4 residences costing $28,000 have been let by Geo. Nicholson, High Park Gdns., as follows: drains, H. Williams, c/o owner; electrical, Geo. Coulson, Lyall Ave.; plumbing, J. Walker, 88 Malvern St.

Power Plants Electricity and Telephones

Campbellville, Ont.
Village Council will submit a Hydro Electric Lighting and Power by-law to the ratepayers on Jan. 10. Chairman, C. Menzies.

Cranbrook, B.C.
Work will stare at once on $250,000 power dam and water tunnel for Kootenay Power Co. Ltd., Cranbrook, B.C. J. L. Campbell, manager. Owners will do all work by dav labor

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Canadian Secretary

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Megantic, Que.
Municipal Council contemplates a dam and other concrete works. Sec-treas., D. L. Lippe.

Miscellaneous

Rockcliffe, Ont.
Rebuilding of Ottawa New Edinburugh Canoe Club expected to start in spring. Pres., Dave Gill, 376 Waverly St., Ottawa.

CONTRACTS AWARDED

Brockville, Ont.
W. H. Comstock's $5,600 boathouse is being wired by R. H. Smart, 193 King St. W.

Montreal, Que.
McKinnon Steel Co. Ltd., Cathcart St., have the contract for sprinkler tank for Imperial Tobacco Co., costing $6,500.

Toronto, Ont.
MacGregor & McIntyre Ltd., Shaw St., Toronto, have the steel contract for $60,000 bowling alley.

A. R. Lundy, 257 King St. W., has the general contract for fencing Eglinton car barns for T.T.C. at cost of $4,500

Fires

Brantford, Ont.
Store owned by Bert Inglis & Son, Dalhousie St., damaged by fire to extent of $5,000. Owners will rebuild at once.

W. L. Hughes, 127 Colborne St., will rebuild store damaged by fire.. Loss estimated at $10,000.

Eagle, Ont.
D. A. McKillop's home at Eagle destroyed by fire. Owner has not yet decided to rebuild.

Hamilton, Ont.
Sterling Meat Co's. store destroyed by fire at loss of $5,000. Owner is J. N. Gellar.

Lefavire, Ont.
Congregation of St. Thomas D'Alfred will rebuild $150,000 church destroyed by fire as soon as possible. Rev. Father Bedard, priest.

London, Ont.
$7,000 loss sustained by Ald. Gordon Blake, 413 Hamilton Rd., when interior of a store was damaged by fire.

Ottawa, Ont.
Fire damaged Jones Motor Sales, 612-14 Bank St., to extent of $3,000. Owners will rebuild.

Quebec, Que.
Basilica destroyed by fire will be rebuilt. Work will commence at once at cost of $1,000,000.

Residence at cor. Richardson and Dorchester Sts., owned by Jos. Letourneau destroyed by fire at loss of $20,000

St. Sylvere, Que.
Stable and barn owned by Felix

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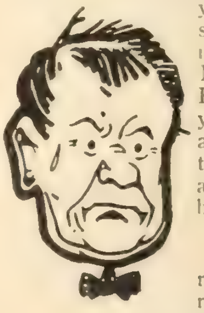

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·BULLETIN ·№ 5·

·BURLINGTON·STEEL·Co·LTD·

RAIL CARBON

REAL STRENGTH

·HAMILTON·ONT·

·AUTOMATIC · PROTECTION·

IF YOU DROP A PIECE OF TOOL STEEL ON THE FACTORY FLOOR IT WILL PROBABLY BREAK BUT THIS DOES NOT CONDEMN THE USE OF TOOL STEEL.

IF YOU BEND A RAIL-CARBON BAR WITH A JERK IT IS LIABLE TO BREAK, BUT NEITHER DOES THIS CONDEMN THE BAR.

THE ELASTIC LIMIT OF A MILD STEEL BAR IS AROUND 33,000 lbs. per sq. inch. THE ELASTIC LIMIT OF A RAIL-CARBON BAR IS WELL OVER 50,000 lbs. per sq. inch OR AN INCREASE OF 50%.

SOME ENGINEERS WILL TELL YOU THEY HAVE SEEN RAIL-CARBON BARS ACCIDENTLY DROPPED AND BROKEN IN TWO

DOMINION PARLIAMENT BUILDING OTTAWA
RAIL CARBON STEEL BARS USED FOR REINFORCING CONCRETE

DID YOU EVER CONSIDER WHAT WOULD HAPPEN TO A MILD STEEL BAR IF DROPPED UNDER SIMILAR CONDITIONS?

THE BLOW WHICH BREAKS THE RAIL-CARBON BAR WOULD STRESS THE MILD STEEL BAR AWAY BEYOND ITS ELASTIC LIMIT, THE METAL WOULD BE PERMANENTLY STRAINED BUT YOU DON'T KNOW IT AND YOUR INSPECTOR CAN'T FIND IT OUT.

BENDING IN THE FIELD IS MOST COMMONLY DONE BY UNSKILLED LABOR. UNSKILLED LABOR RARELY REALIZES THAT ANY AND EVERY BAR MUST BE BENT AROUND THE MANDRIL SLOWLY IN ORDER TO ALLOW THE METAL TO "FLOW."

THE WORD YANK IS NOT DEFINED IN WEBSTER'S DICTIONARY BUT IT MIGHT VERY TRULY BE DEFINED AS "THE PREVAILING METHOD, EMPLOYED BY UNSKILLED LABOR IN BENDING REINFORCING BARS."

UNDER THE "YANK" METHOD, THE MILD STEEL BAR IS PERMANENTLY STRAINED AND IS SO EMBODIED IN THE STRUCTURE,— THE HOOK AT THE END OF YOUR RODS IS RENDERED USELESS.

UNDER THE "YANK" METHOD THE RAIL-CARBON BAR BREAKS AND IS THROWN OUT, — AND YOUR CONTRACTOR SOON SEES TO IT THAT THE "YANKING" STOPS.

WHICH DO YOU PREFER:
AUTOMATIC PROTECTION OR CONCEALED DEFECTS?

WE HAVE EVERY MODERN FACILITY AT OUR PLANT FOR BENDING TO YOUR SCHEDULE AND PREFER TO SHIP THE BARS TO YOU CUT TO LENGTH, TAGGED AND BENT READY TO DROP INTO THE FORMS.

WE PRIDE OURSELVES ON FAST AND ACCURATE DELIVERIES.

WHY NOT TRY US OUT?

·BULLETIN ·№ 6 - THE ·SPECIFICATION·

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Production, efficiency and your employees' health, all depend upon the heating and ventilating of your plant.

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Ask for folder 606 and invite the co-operation of the Sturtevant sales-engineering staff. They know from years of varied experience the most efficient, economical installation for your particular needs.

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of Canada, Ltd.
MONTREAL GALT TORONTO

Rivard destroyed by fire. Loss is about $6,000 and owner will probably rebuild.

St. Thomas, Que.
Furniture factory owned by Emile Collins destroyed by fire at loss of $40,000.

Waterville, Que.
Abattoir and barn valued at $20,000 destroyed by fire. Albert Pratte, owner, will probably rebuild.

Westboro, Ont.
George Moulds, Florence St., will rebuild house destroyed by fire at loss of $5,000.

Yarmouth, N.S.
Business block owned by Kaplan & Stein damaged to extent of $30,000. Owners have not definitely decided to rebuild.

Late News

Coteau Station, Que.
G. T. Rly., Montreal, has commenced work on $10,000 aqueduct and pipe line from Coteau Landing to Coteau Station. DeLery MacDonald, 34 St. Mathieu St., Montreal, has the general contract.

Hamilton, Ont.
Steel Realty Development Corp. is excavating for 10 residences to cost $35,000. This company contemplates 20 residences costing $80,000—$100,000. Harry Mellon, manager.

New Watford, N. S.
The Hospital Board, George Cockburn, chairman, will erect a $70,000 building. A. J. McCormack, Sydney, N. S., architect.

Rivieres Des Prairies, Que.
Back River Power Co. has had preliminary plans prepared for $7,000,000 power development plant.

Toronto, Ont.
T. Eaton Co. Ltd., will make alterations and additions to departmental store. Sproatt & Rolph, North St., architects.

Interlocking Tile Co., Toronto St., Toronto, Ont., have contract for tile for Bell Telephone Co.'s "Grover" Exchange.

Waterloo, Ont.
Separate School Board is having plans prepared by J. M. Cowan, St. Vincent St., Toronto, for an addition to Waterloo School.

Will Build More Roads

An appropriation of $32,300,000 for construction of forest roads and trails and rural post roads in the United States as authorized under the Federal Highway Act, was recommended in the agricultural supply bill for the next fiscal year.

Dry-dock Work Resumed

Resumption of work on the Esquimalt dry-dock has been formally ordered by Hon. J. H. King, federal minister of Public Works.

The work is expected to be completed about June, 1924, and will cost a total of $1,500,000. Tenders for $500,000 worth of operating plant and equipment will be called for soon.

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for Interior Construction

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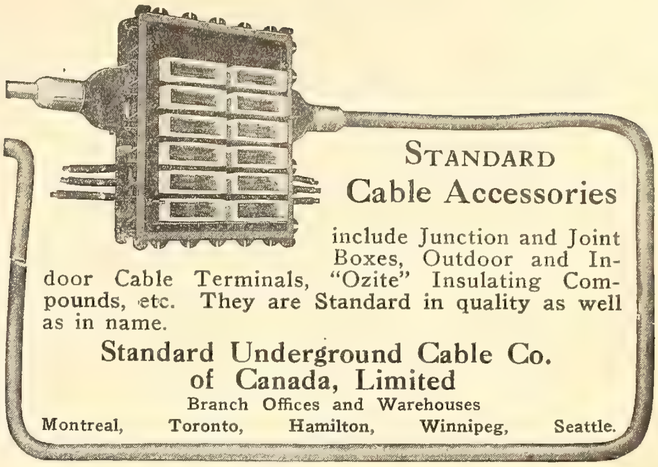

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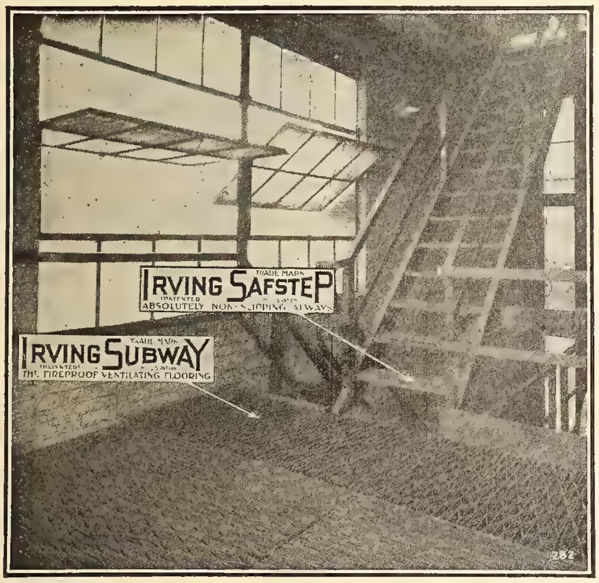
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UNUSUALLY complete equipment and an experienced organization have won for us an enviable reputation for service. Orders large and small receive our prompt attention, and delivery is made **on time.**

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1—HOISTING ENGINE 6½ x 8, D.C.D.D. with swinger and A frame derrick mounted on standard gauge car.
1—HOISTING ENGINE 5 x 7 D.C.S.D without boiler.
3—miles 16 lb. Relaying Rail.
5—miles 30 lb. Relaying Rail.
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CANADIAN TANKS DES MOINES TRADE MARK

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CANADIAN DES MOINES

Current Prices of Building and Engineering Materials

		Toronto	Montreal	Winnipeg	Vancouver
CEMENT (Delivered on job):—					
Retail lots including bags	per bbl.	$4.60	$4.40	$4.80	$3.70
Car lots, including bags	per bbl.	3.85	3.68	4.16	3.35
Refund on bags	each	.20	.20	.20	
LIME (Delivered on job):—					
Lump, in retail lots	per ton	14.30	14.00	.58 bu.	2.70 bbl
Lump, in car lots	per ton	12.70**	11.00	13.80 ton*	2.60 bbl
Hydrated, in retail lots	per ton	20.00	26.00	.60 bag*	30.00
Hydrated, in car lots	per ton	19.00	21.00	.54 bag*†	25.00
BRICK and TILE (Delivered on job):—					
Common face brick	per M.	24.00	16.00*	19.00	30.00
No. 1 dry pressed brick	per M.	31.00	30.00	36.00	70.00
No. 2 dry pressed brick	per M.	29.00	25.00	32.00	
Enamelled brick	per M.	125 up to	230.00	185.00	150.00
Wire cut brick, for foundation work	per M.	21.00	19.00		50.00
Sand lime brick	per M.	17.00		18.00	
Hollow building tile	per M.			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	60-95	60-75	85-100	80.00
Fire clay	per ton	13-20	15-16.00	35.00**	22.00
STONE, SAND and GRAVEL (f.o.b. cars on siding):—					
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.00 yd.
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 "	" "
Crusher run	per ton	2.20½		3.00 "	" "
Rubble stone	per ton	2.45	1.70	15.00 cord	" "
Gravel, 2 in. screened	per ton	2.05		2.45 yd.	" "
Gravel 1 in. screened	per ton	2.31	1.50	2.75 "	" "
Sand, screened	per ton	1.42½	1.25	1.90 "	" "
Pit run	per ton	1.52¾	1.25	1.90 "	" "
STEEL and IRON (f.o.b. warehouse):—					
Mild steel bars, ¼ in. and heavier	per 100 lbs.	3.25 base	3.25 base	4.35	$4.00
Bands 3/16 in. and lighter	per 100 lbs.	3.75 "	3.25 "	4.85 base	
Hoops	per 100 lbs.	4.50 "	4.25 "		
Twisted and deformed bars	per 100 lbs.	3.35 "	3.25 "	4.20	4.00
Angles, channels and tees under 3 in.	per 100 lbs.	3.35 "	3.75 "	4.95	6.00
Structural shapes	per 100 lbs.	3.60 "	3.75 "	4.75	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.25 "	3.50 "	4.75	6.25
Plates—3/16 in.	per 100 lbs.	3.60 "	3.85 "	5.15	6.50
Plates—10 gauge	per 100 lbs.	4.15 "	4.00 "	5.45	6.50
Black sheets—28 gauge	per 100 lbs.	5.00 "	4.50 "	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.20 "	6.00 "	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	6.20 "	6.50 "	7.70	8.25-8.50
Rivets	per 100 lbs.	5.75 "	5.50 "	7.00 base	
Cast iron pipe	per ton	60.00	55.00		
VITRIFIED CLAY PRODUCTS (Delivered on job):—					
Sewer pipe, 4 in.	per ft.	.40	.30	.35	.28
Sewer pipe, 6 in	per ft.	.60	.45	.45	.48
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.55
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.70
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.85
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00	.90	.65	.75
Chimney tops	each	9.00	3.50–5.00	7.50	4.50–6.00
Discounts		45 % truck lots	20 %		
		50 % car lots	50 %	5 %	

CEMENT:—*Discount of 10 cts. per bbl. in 20 days. Price f.o.b. cars is $3.75 †Subject to 5% discount. **Excluding bags.
LIME:—*Discount of 5%. †Bag of 50 lbs. **Price f.o.b. cars is $11.70.
BRICK AND TILE—*f.o.b. plant.
STONE SAND AND GRAVEL:—*Winnipeg prices subject to 5% disco **Toronto prices include sales tax.

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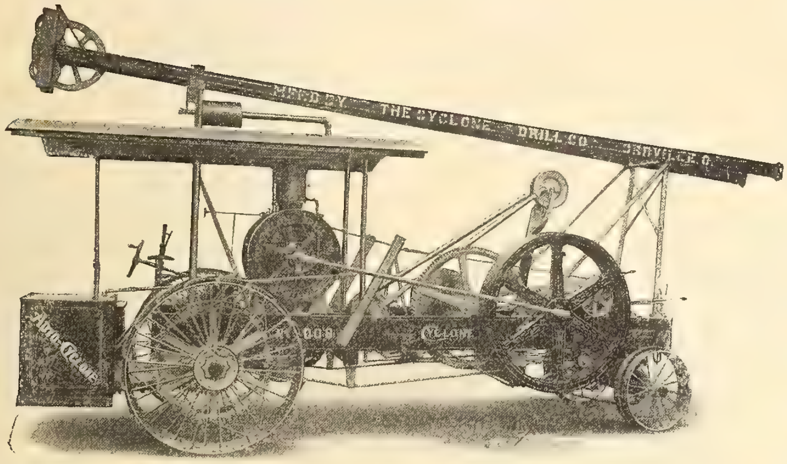

Cyclone No. 14 Gasoline Traction Blast Hole Drill

The Big Hole Method of Drilling is a Twentieth Century Development. It is now acknowledged by all authorities this method produces broken stone or ore in the cheapest and most efficient way.

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The most important Quarries of Canada and the United States are equipped with Cyclone No. 14 Blast Hole Drills. Many Canadian Contractors use them to advantage on big Rock Excavation work.

No. 14 Cyclone Blast Hole Drills can be supplied in Traction or Non-Traction Type and with any kind of Power desired.

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Lumber (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver*
Flooring, 1 x 3 and 4 in., clear, E. G. fir	per M.	100.00	60.00	84.00	55.00
Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	75.00	65.00	56.00	30.00
Flooring, No. 1 pine	per M.	70.00	80.00	64.80	
Flooring, No. 1 Spruce	per M.	45.00	40.00	39.60	
Flooring, birch and maple, 13/16 in. clear	per M.	130.00	110.00	152.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	130.00	125.00	140.00	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	75.00	60.00	56.00	30.00
V joint, No. 1 pine	per M.	70.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	43 58	45.00	63.75	
Pine, 2 x 4 to 12 in., common rough	per M.	50/55	70.00	36.00	
Hemlock, 2 x 4 to 12 in.	per M.	40-42.00	40.00	36.00	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	40–50.00	50.00	36.00	11.00-13.50
Spruce, 1 and 2 x 4 to 12 in.	per M.	41/46	45–35	36.00	
Timbers, fir, 10 x 10 in. and up	per M.	65.00	58.00	47.00 base	17.-22.00
Lath, No. 1 white pine	per M.	14.00	12.00	12.00	
Lath, M. R. spruce	per M.	10.00	8.50	10.00	7.00
Shingles, XXX B.C. cedar	per M.	6.35	5.00	5.25	3.40
XX B.C. cedar	per M.	5.00	4.25	3.75	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	108.00	55.00
Fir casing	per M.	1 ct. per in.	100.00	108.00	

PAINTS, OILS, COLOURS (delivered):—		Toronto	Montreal	Winnipeg	Vancouver*
White lead ground in oil, less than ton lots	per cwt.	14.00	13.35	14.85	15.80
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	22.00
Putty in bulk	per cwt.	6.70	3.75	5.50	9.25
Steel sash putty in bulk	per cwt.	7.20	6.00	8.75	7.75
Boiled linseed oil, in bbls.	per gal.	1.15	1.04	1.13	1.28
Raw linseed oil, in bbls.	per gal.	1.18	1.02	1.10	1.25
Turpentine, in bbls.	per gal.	2.00	1.95	2.15	1.60
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 4/5	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 1/5	.45

PLASTER (Delivered):—		Toronto	Montreal	Winnipeg	Vancouver*
Hard wall plaster, sanded	per ton	13.50	15.00	25.00	30.00
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Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu.	1.50

LABOR:—		Toronto	Montreal	Winnipeg	Vancouver*
Bricklayers	per hr.	1.00	.80–.90	1.15	1.06¼
Structural Iron Workers	per hr.	.85	.50–.75	1.25	1.00
Plasterers	per hr.	1.00	.80	1.05	1.06¼
Hoisting Engineers	per hr.	.70–.80	.50	.90–1.10	1.00
Plumbers	per hr.	.90	.60–.75	1.00	.90
Carpenters	per hr.	.80	.65	.90	.81¼
Painters	per hr.	.75	.55–.65	.80	.81¼
Electrical Workers	per hr.	.80	.65	.70– .90	1.00
Roofers	per hr.	.65	.65		.90
Laborers	per hr.	.40–.50	.30	47½–.55	.50–.56¼
Sheet Metal Workers	per hr.	.75			.90

LUMBER:—*Owing to the general unstable condition of the present lumber market, Vancouver dealers refuse to quote any prices at all especially for Prairie or Eastern publication. The prices are, moreover, fluctuating from day to day. Such prices as we quote are, therefore, averages and not standard.

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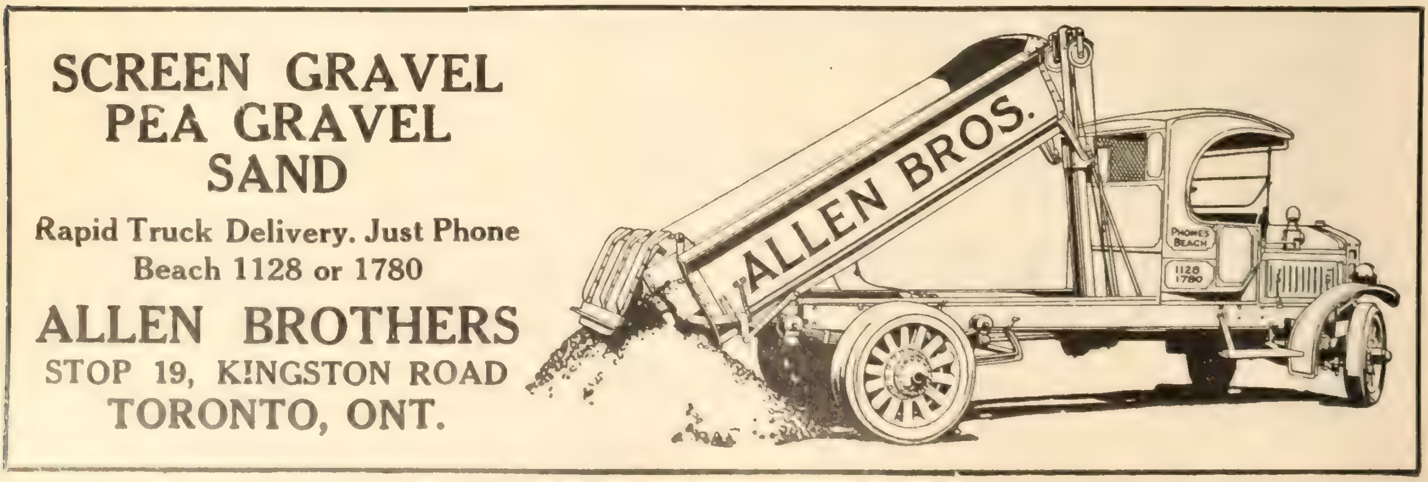
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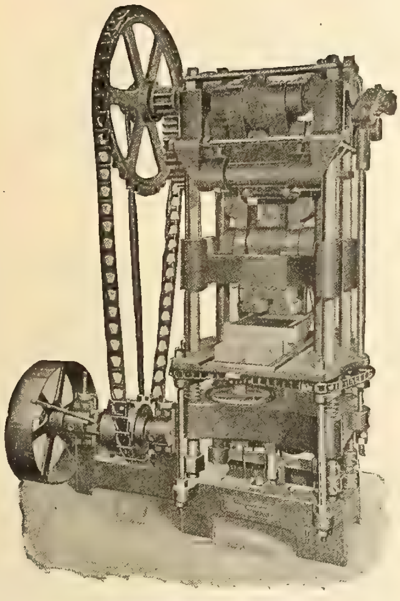

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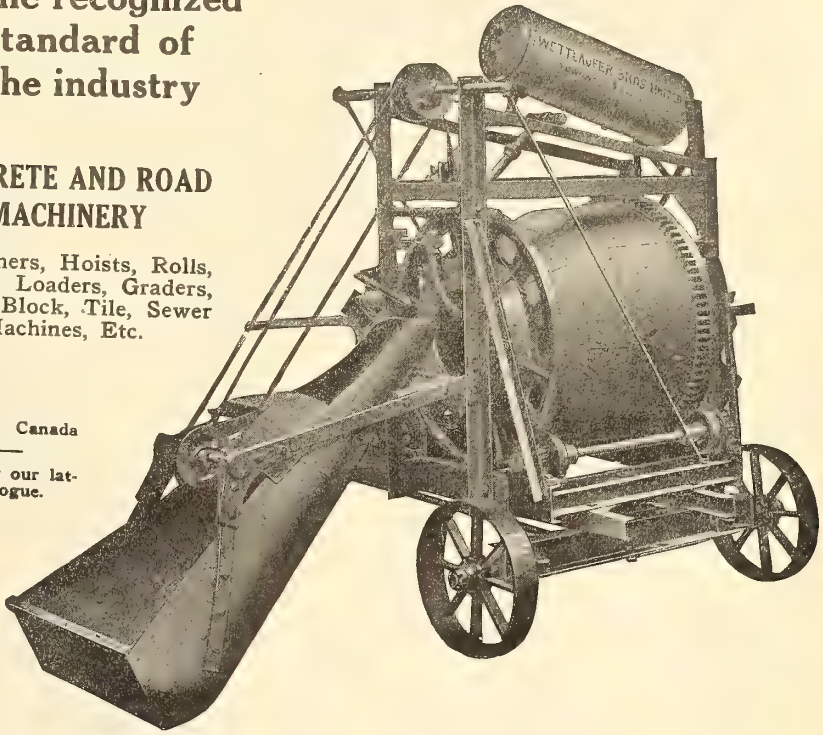

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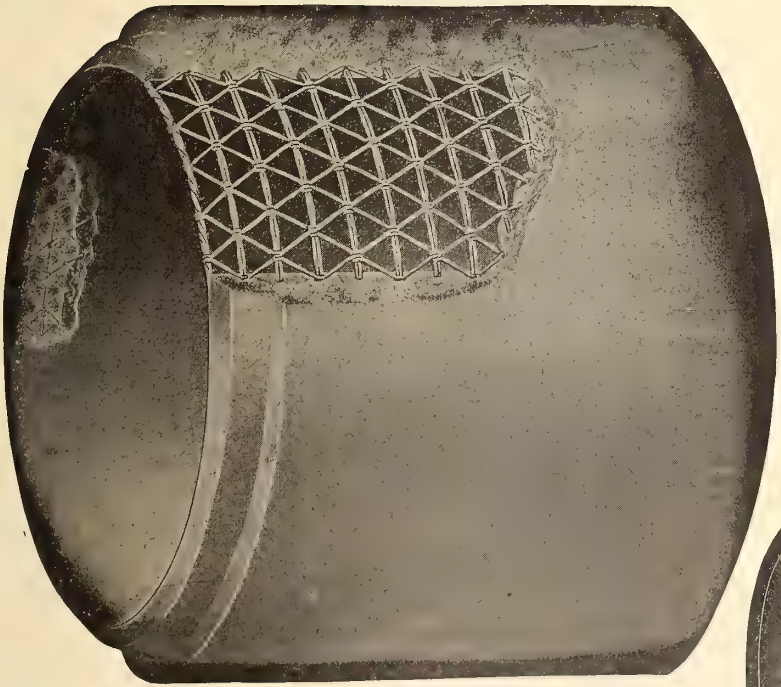

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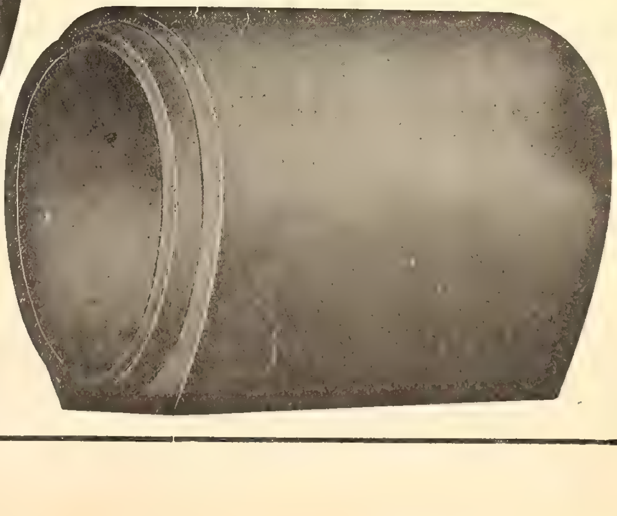

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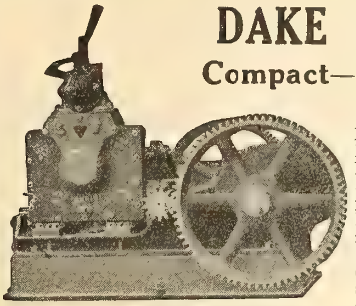

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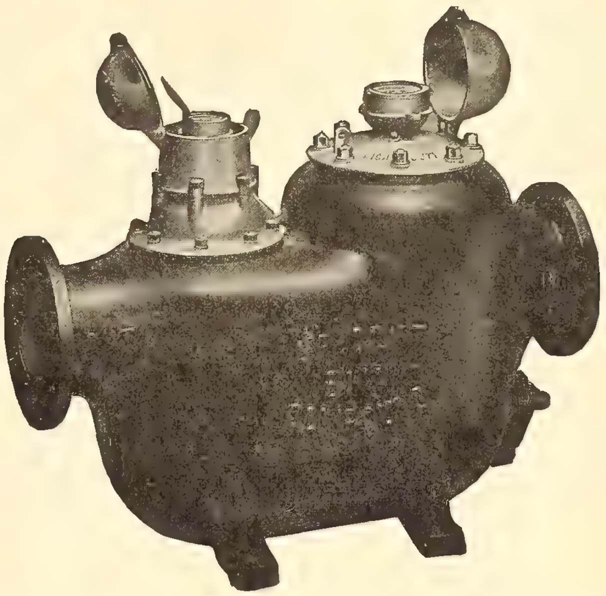

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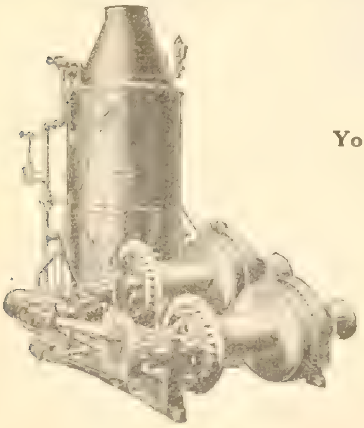

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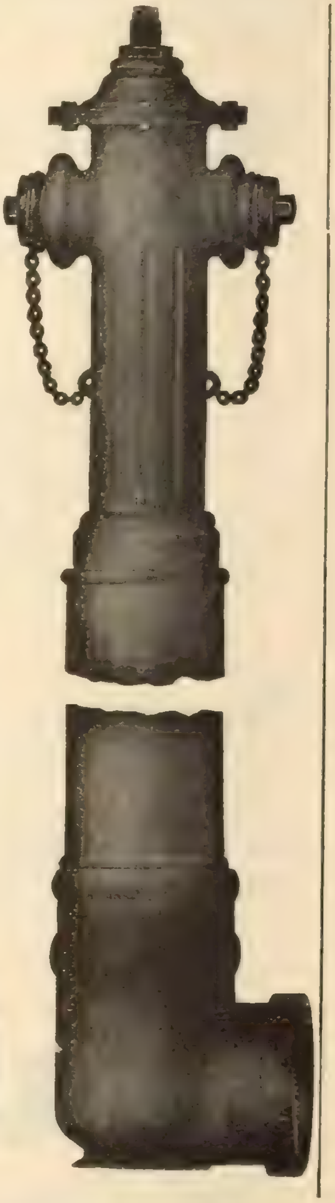

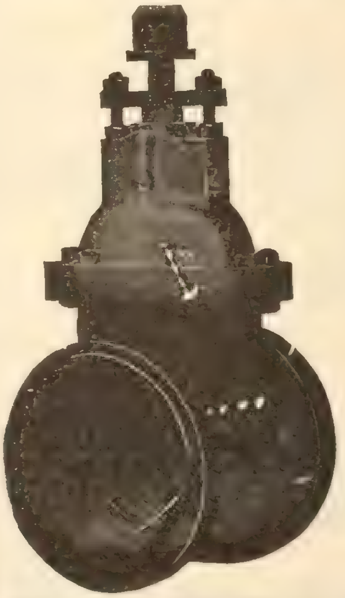

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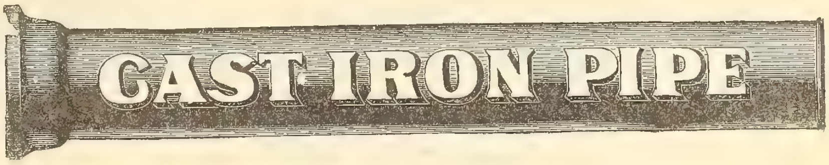

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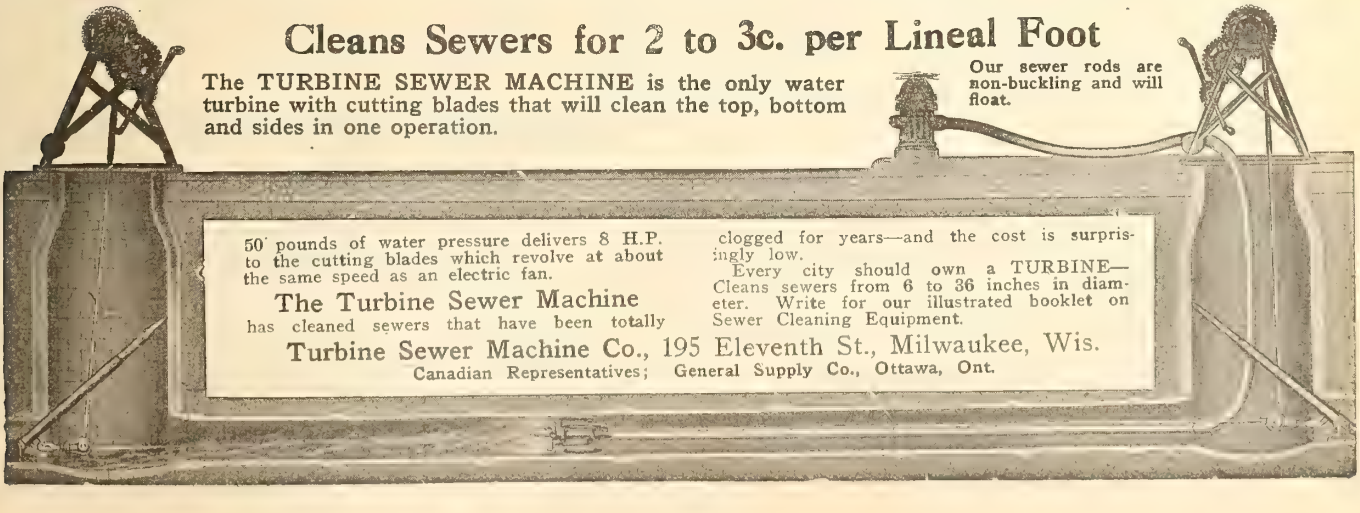

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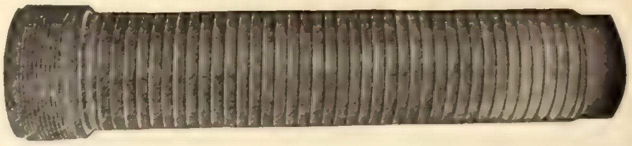

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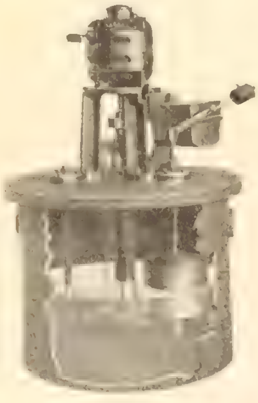

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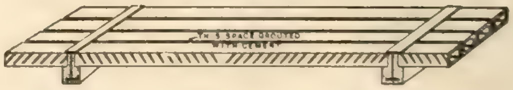

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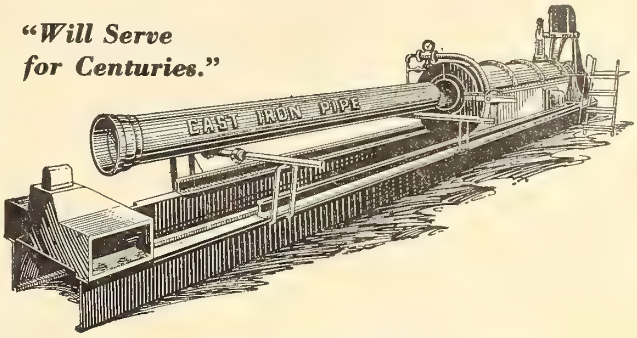

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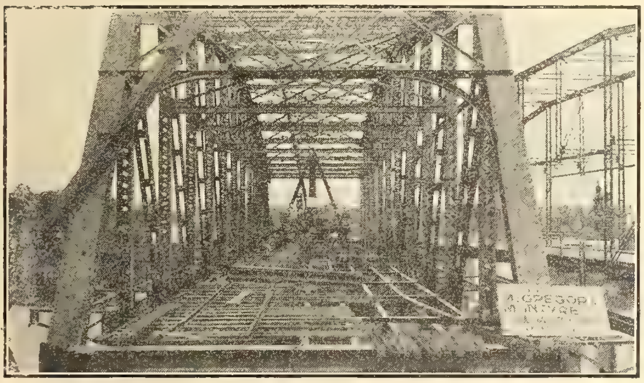

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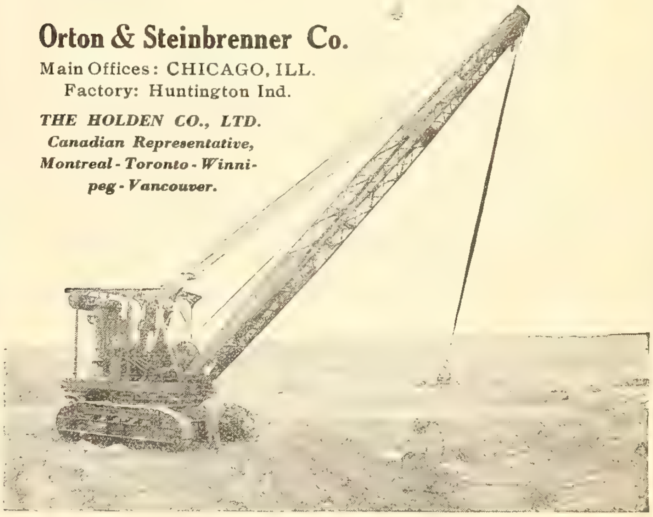

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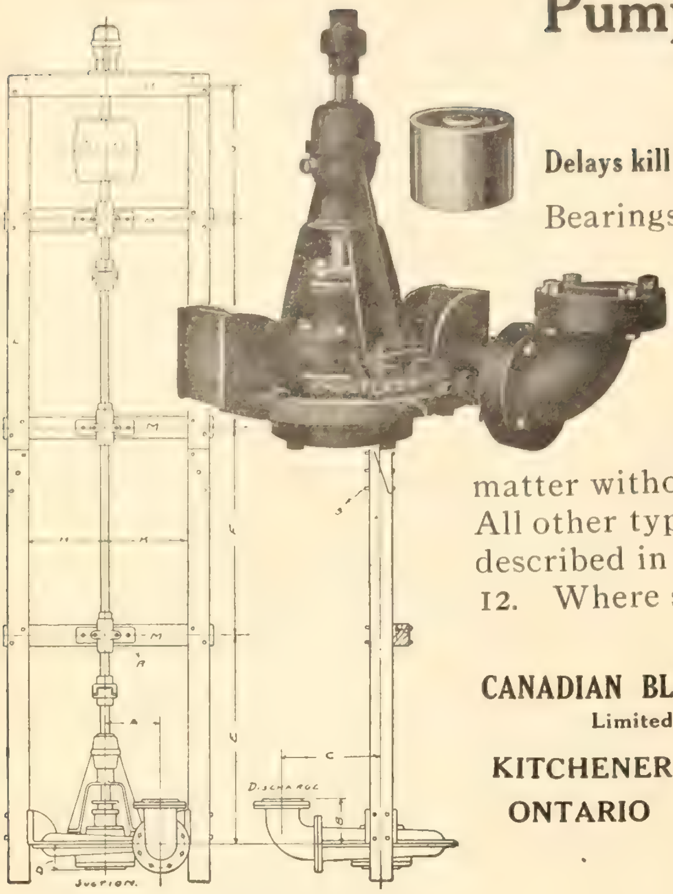

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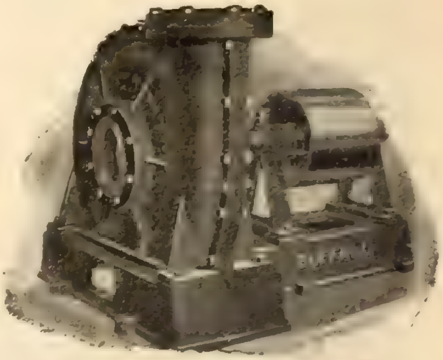

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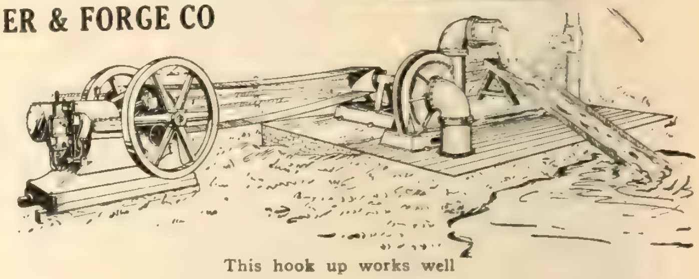

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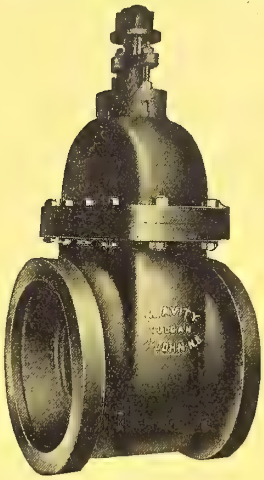

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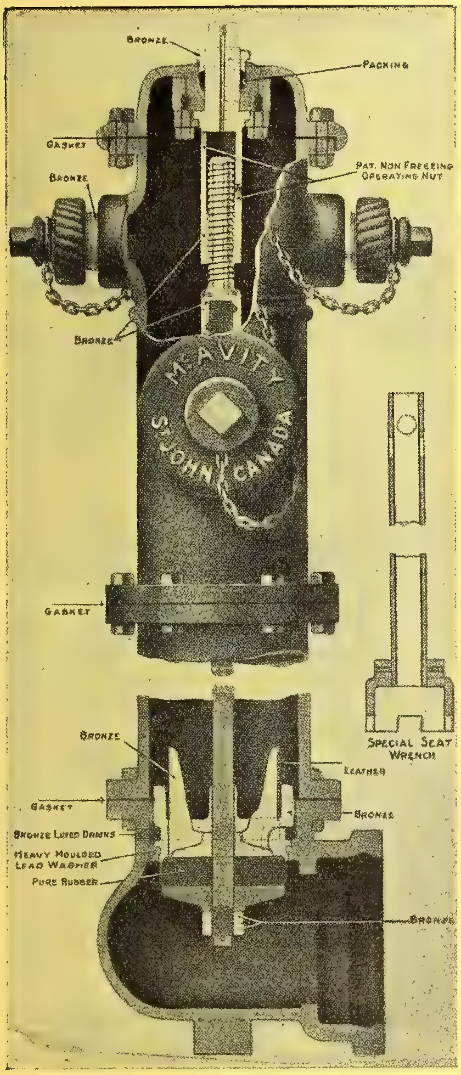

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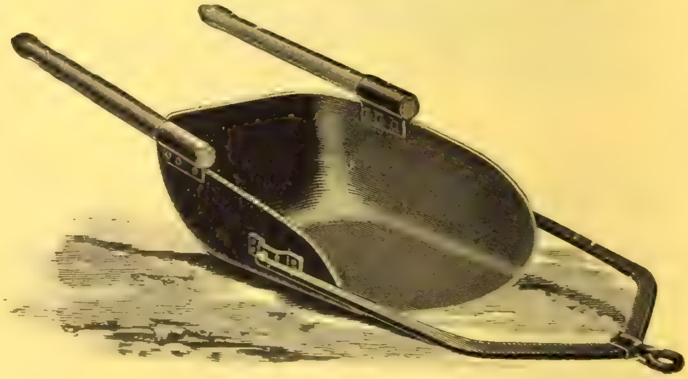

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C. S. Pipe

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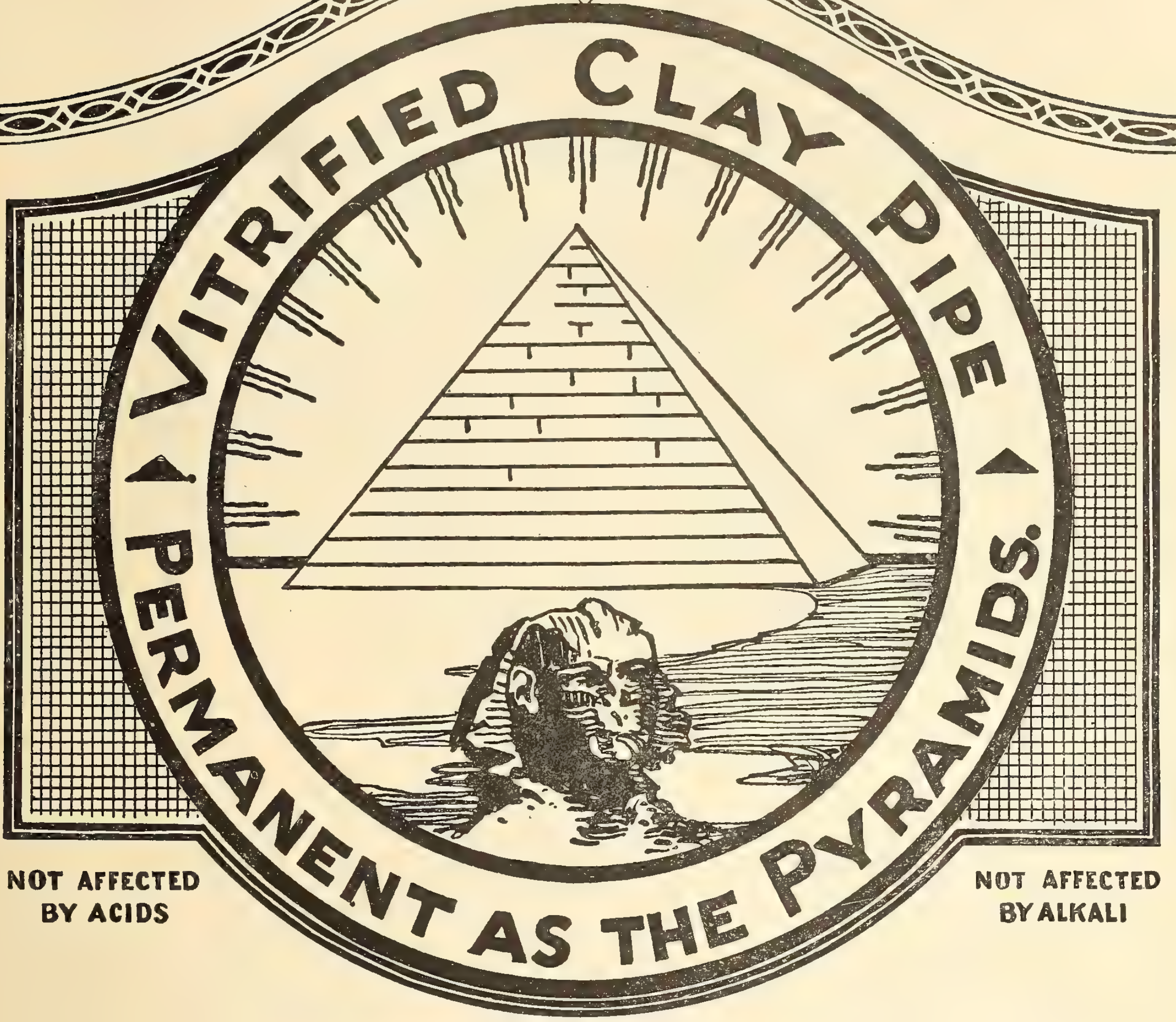

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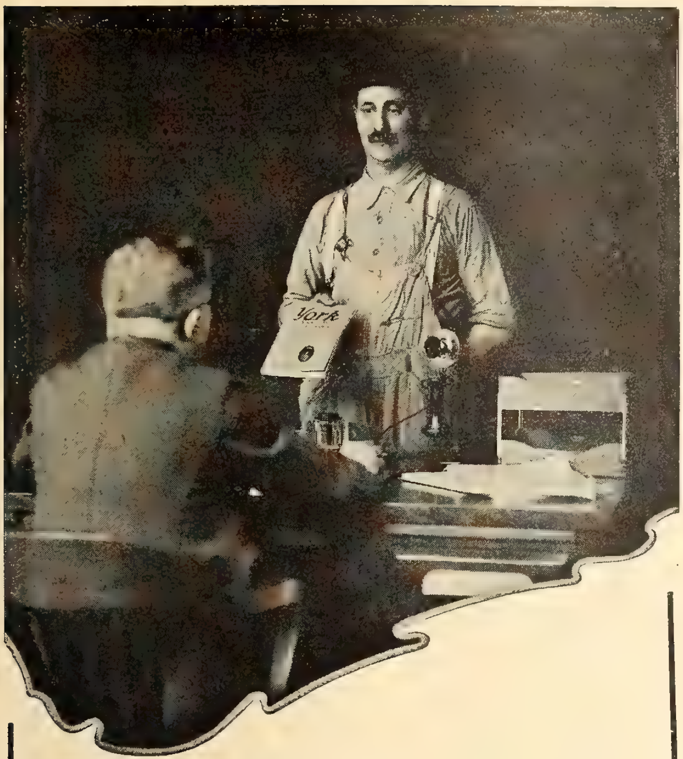

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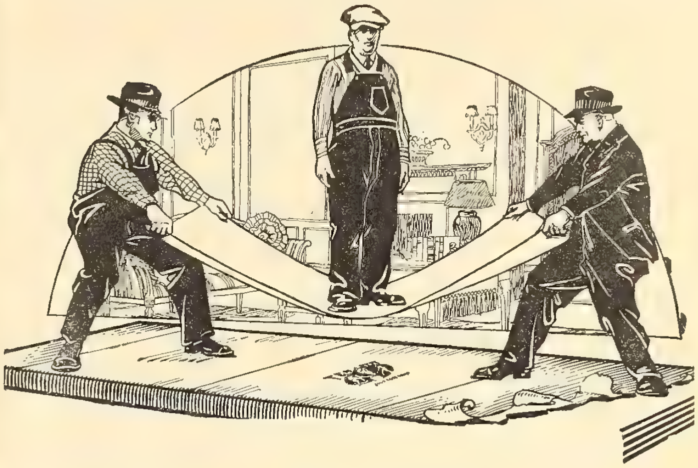

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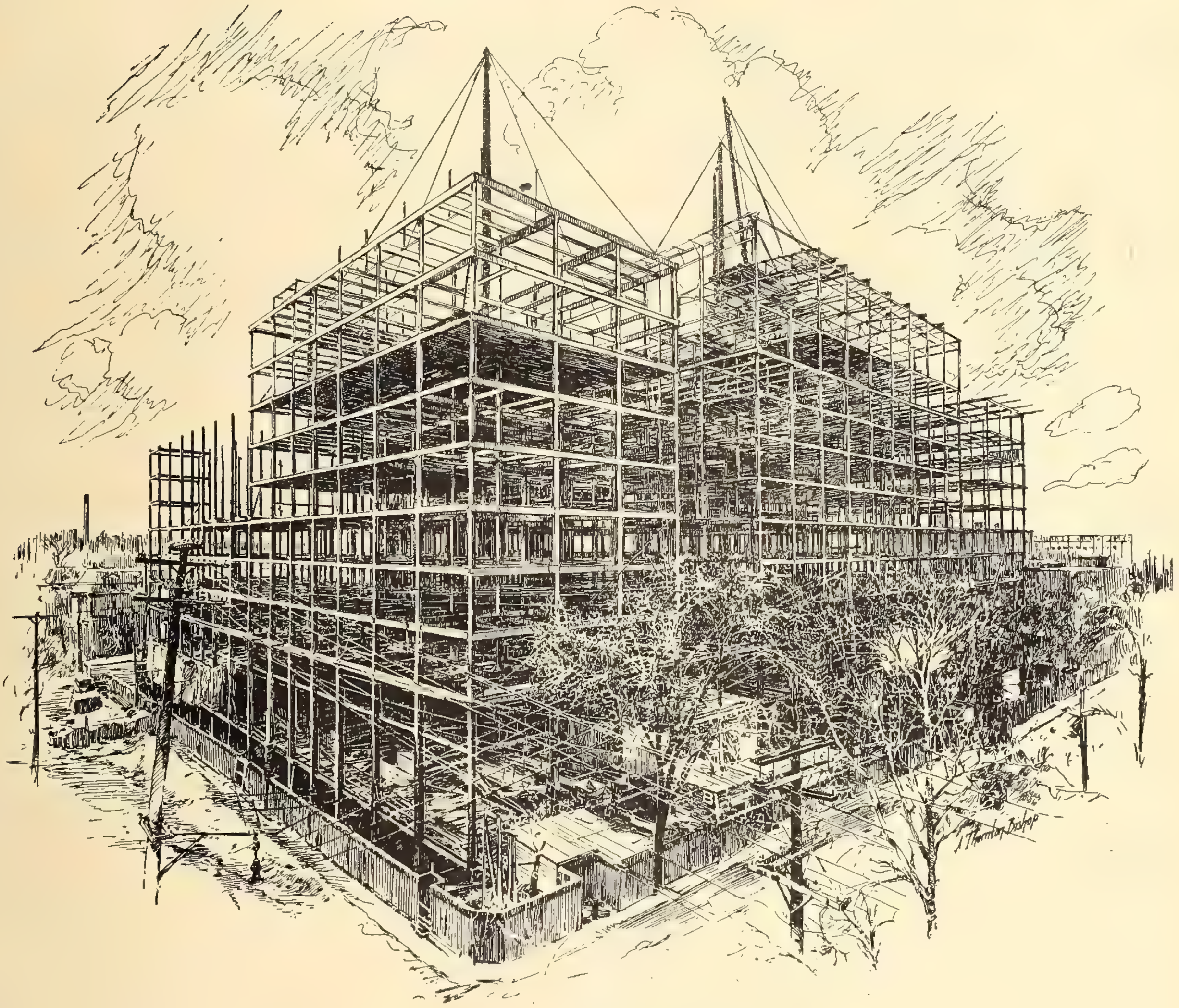

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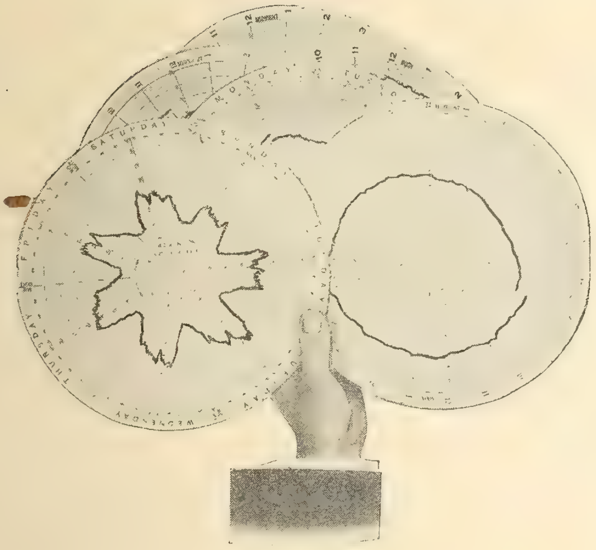

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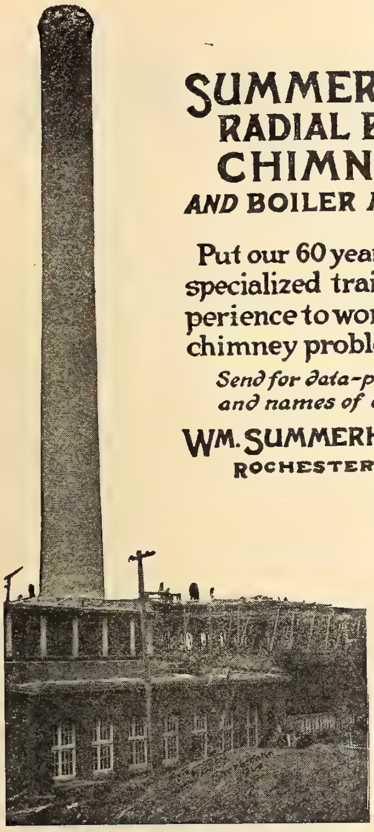

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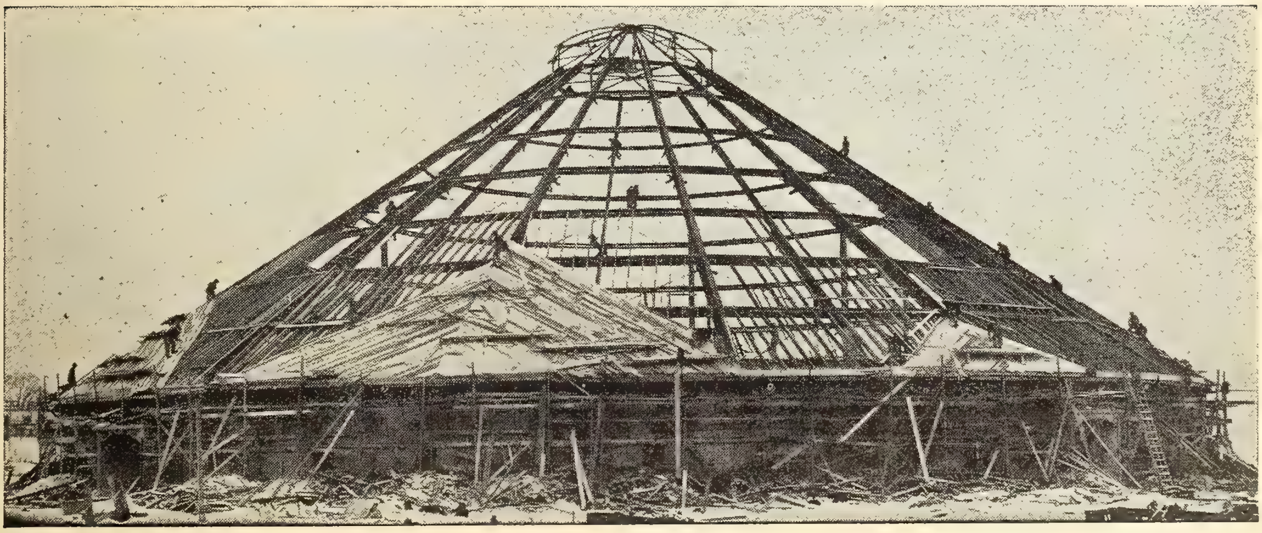

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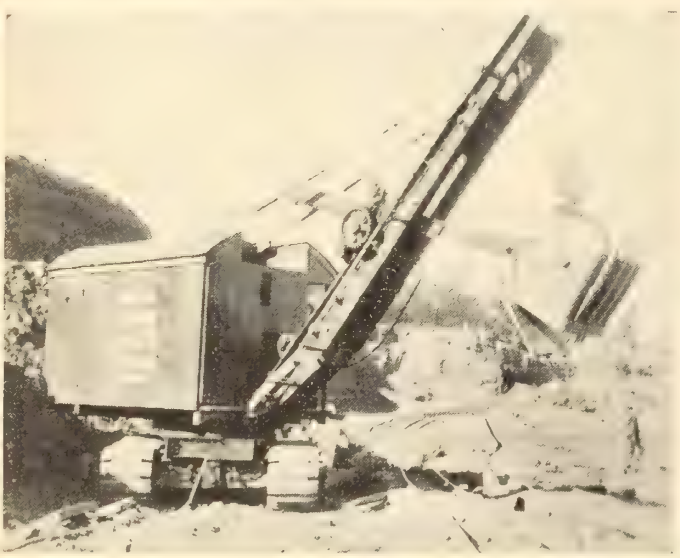

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"Operation and Maintenance of Irrigation Systems," by S. T. Harding. First edition, published in 1917 by the McGraw-Hill Book Co. 271 pages, illustrated. Price $2.50.

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"Relief from Floods." The Fundamentals of Flood Prevention, Flood Protection and the means of determining proper remedies. By John W. Alvord and Charles B. Burdock. First edition, published in 1918 by McGraw-Hill Book Company, Inc. 175 pages, illustrated. Price $2.00.

"Steel Bridge Designing," by Melville B. Wells, C.E. Published by Myron C. Clark Publishing Company in 1913. 260 pages, illustrated. Price $2.00.

"The Engineering Index for 1920" - recently published by the American Society of Mechanical Engineers, 586 pages, price $6.00.

"Use of Water in Irrigation," by Samuel Fortier. Published in 1915 by McGraw-Hill Book Company. 265 pages, illustrated. Price $2.00.

"Use of Water in Irrigation," by Samuel Fortier. Second edition. Published by McGraw-Hill Book Company, 1916. 325 pages, illustrated. Price $2.50

"Water Purification," by Joseph Ellms. Published in 1917 by McGraw-Hill Book Company. 485 pages, illustrated. Price $5.00.

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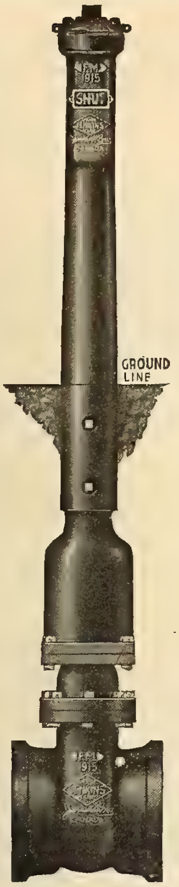

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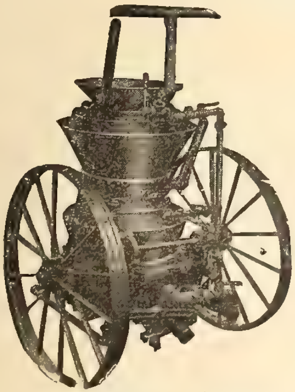

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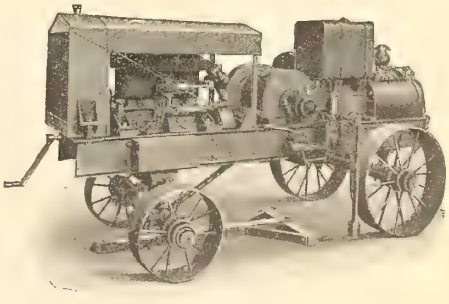

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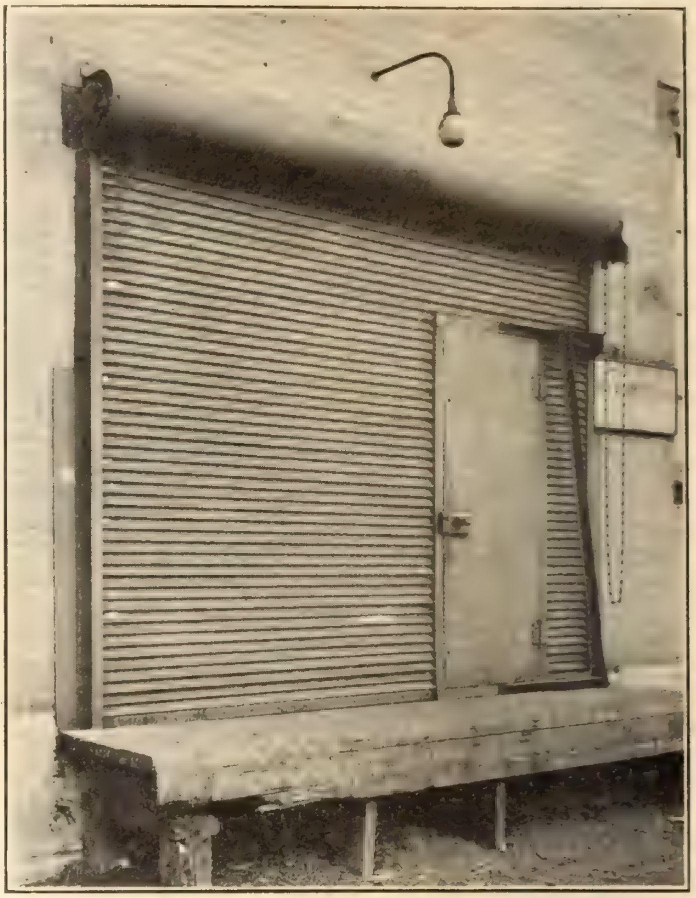
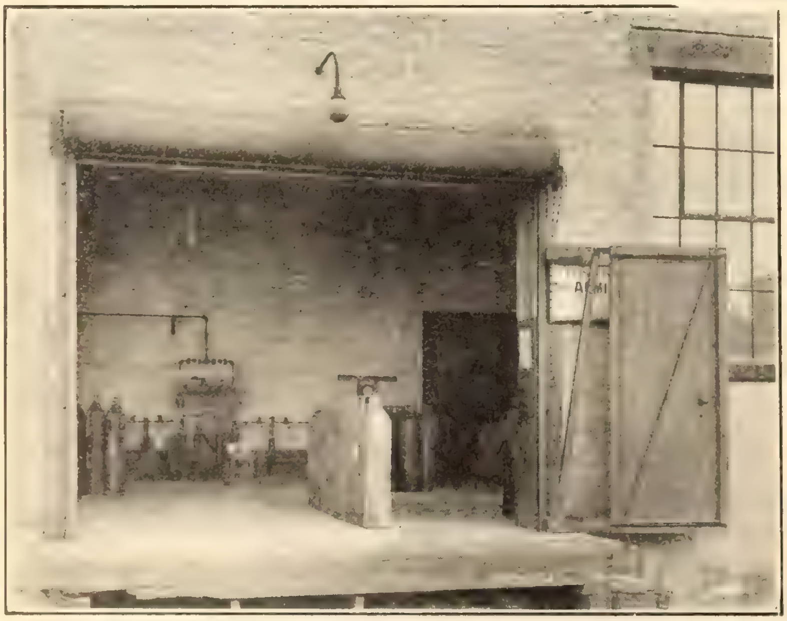


Rolling Steel Door with Hinged Wicket Door at Lever Bros. Ltd., Toronto. This Wicket Door when Rolling Steel Door is to be raised, is swung to one side. Note Cut below.



Showing Wicket Door swung back and Rolling Steel Door raised at Lever Bros. Ltd., Toronto. Note closed Wicket Door at rear

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Vol. 37 **Toronto, January 10, 1923** **No. 2**

The Importance of Irrigation as a Construction Enterprise

Irrigation seems to be one of those items of construction that are generally overlooked by contractors, at least it is not regarded in as important a light as it should. Perhaps this is because we are used to having our minds concentrated on the ultimate purpose of irrigation "to make the desert blossom as the rose" instead of viewing it as essentially an engineering and contracting proposition. And yet that is just what irrigation is—the digging of ditches, large and small, the construction of dams, the building of structures of all sorts and the installation of flumes, syphons and other specialized devices. The money that is involved in the successful completion of a modern irrigation scheme may run into millions—even the small projects cost hundreds of thousands of dollars. To most people it will be a revelation to know that already some of the large scale developments completed and in progress of construction in Western Canada have involved over thirty-three million dollars. It is thus quite evident that irrigation is a construction proposition of no mean proportions.

What will be spent in the future is hard to forecast, of course, but the fact that irrigation has already firmly established itself in the arid parts of this country is sufficient justification for the belief that as the West becomes more populous, there will be a demand for an extension of irrigation into parts of the country that are now nothing but waste. Even at the present time, there are in prospect several schemes that will involve $30,000,000, it is estimated by E. F. Drake, director of the Reclamation Service. In addition, drainage projects in the swampy parts of the West involve large sums of money, $7,000,000 being the amount estimated in the case of one large undertaking. These figures show what possibilities there are for those contractors who are prepared to venture into the irrigation field

Minimizing Fire Losses by Better Building

Canada's record of fire losses has never been an enviable one. It has always been conceded that this country had the highest per capita fire loss in the world—a loss beside which that of European countries fades into comparative insignificance. To account for this condition—which we can reflect upon only with a certain sense of shame—several reasons have been advanced. Boiled down, these explanations suggest that rampant carelessness is largely the factor that is responsible for our high losses. And the price which is exacted, as a result, is a destruction through flames and smoke that is twenty-five times what it would be if we were as careful as some European nations are.

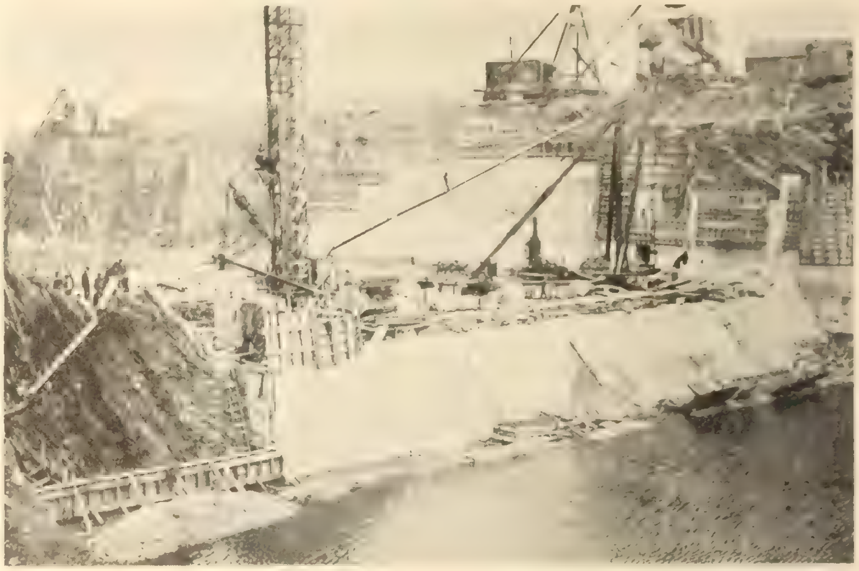
Deplorable as this condition has been, there is no evidence to indicate that the seriousness of our fire losses is being realized—at least the estimates of the losses that are compiled year by year do not indicate this. During the past year, for example, a new record was set—a loss that is nearly 50 per cent greater than 1921's and that exceeds the previous high record of 1918. Forty-four million dollars worth of property, it is estimated, went up in smoke in 1922 as compared with nearly thirty millions in 1921 and twenty-seven millions in 1920. These figures however, do not adequately represent the entire loss that was occasioned by fire, for many other elements than the actual property damage are involved—intangible losses that are almost impossible to reduce to a monetary basis.

For the readers of this paper, these startling disclosures have surely some significance. It is the product of the skill of Canadian contractors and builders that is going up in smoke; it is surely right, therefore, that they should be seriously concerned with the enormity of the destruction that fire is responsible for and be anxious to do anything and everything to reduce the seriousness of these losses. Some responsibility must devolve upon designers and builders to see that their structures are built safely and soundly in order to reduce the fire hazard to the smallest possible dimension.

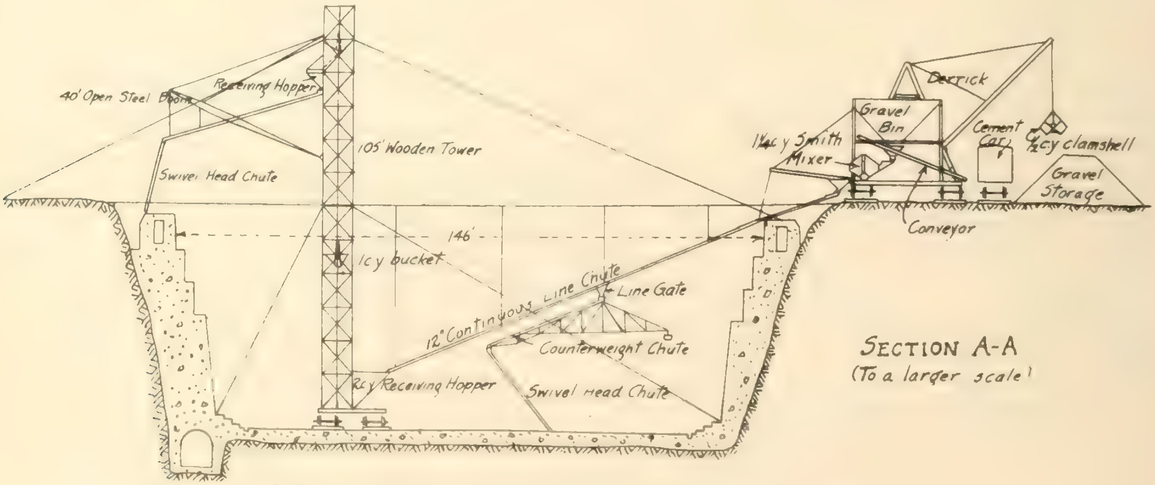
Build well is one message that a forty million dollar fire loss suggests. Build so that flames will not have an undisputed chance. Fire resistive construction is a comparatively simple thing to achieve. Even the frame house, built almost exclusively of combustible material, by the use of a few simple expedients can be made highly resistive to destruction by fire. All that is needed is a little more appreciation of the value of fire-stopping and similar practices on the part of architects, contractors and the framers of building by-laws. The universal adoption of absolutely fireproof construction, if such a thing exists, is not economically desirable or necessary. Much can be accomplished by just making some of the ordinary types of construction just a little more resistant to the effect of fires.

The Plant Used for the Construction of the St. John, N.B., Drydock

In any job involving large yardages of concrete, the character of the plant for mixing and placing the material largely determines the efficiency of the construction operations. At St. John the contractors for the drydock have developed a plant that has been unusually satisfactory in contributing to the speed and smoothness of the work. A complete description of it is presented in this article.



This concrete plant consists of two separate yet practically identical travelling units. Both units are located on the south side of the drydock, one reason for this being that this face of the pit excavation is more uniform and more nearly vertical than the north side, thus allowing a straight track layout, with the plant nearer the work than if situated on the north side. Another reason is that the gravel supply comes from a beach to the south of the dock, and to place this in storage along the north side would necessitate a train haul up and down heavy 4% grades in crossing to the north side through the dock entrance.



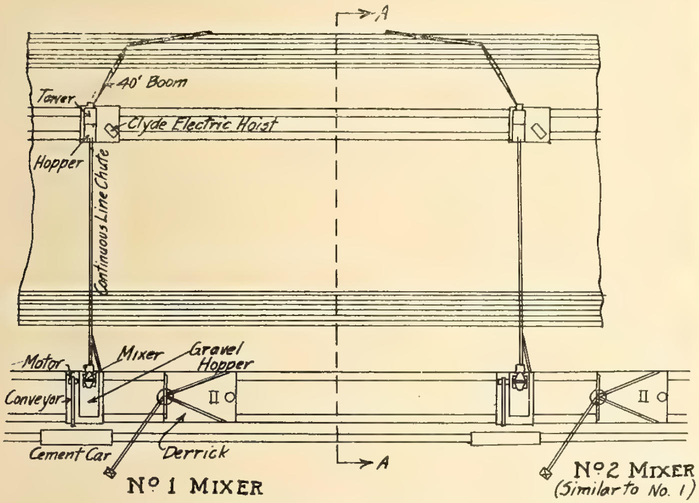
A sketch of the layout of one mixer unit on the St. John drydock

Each of the travelling units consists of a one-yard Smith mixer, driven by 35 h.p. motor, mounted on a travelling carriage, equipped with storage measuring hoppers for gravel and cement, charging hoppers over the mixer, and on one side an inclined belt conveyor, chain driven by the mixer motor, so located that cement can be placed on it from the door of the cement car situated on a separate track directly behind the mixer. Bags are delivered by the conveyor to the charging platform above and in front of the mixer, the conveyor being so arranged that it will itself store the bags of cement on the charging platform, leaving the man at this point free to attend to the charging of the mixer. When the full supply of cement has been elevated, this man throws a clutch on the elevator drive and so prevents the arrival of an excess stock of cement. One man located behind and on the same level as the mixer, by means of a series of levers charges the mixer with measured quantities of gravel, cement and water and also dumps the batches. A third man, in front of the mixer, operates the gate of the discharge hopper regulating the flow in the chutes.

Alongside each mixer and operating on the same pair of standard gauge tracks is a stiff leg clam shell derrick with a three drum Beatty hoist and swinger. This derrick picks up the gravel from the storage pile in the rear of the mixing unit and delivers it to the gravel bin over the mixer. The derrick hoisting engines are provided with a drum shaft extension and nigger heads for moving the mixing plant or derrick in either direction, with a snatch block made fast to the track ahead or behind. The mixer carriage and travelling derrick are blocked when pouring concrete.

Towers for Relaying Concrete

On the drydock floor with each mixer unit is located a 105 ft. wooden Insley travelling tower. The tower is capable of movement independent of the mixers, but when linked up with the mixer, the tower stands directly opposite it and is connected thereto with a line of 12" Insley chutes. In this connecting line of chutes, directly over the wall nearest the mixer, is introduced an Insley line gate from which is suspended a line of chutes for pouring this south wall, these being carried by a cable extending lengthways of the dock over this wall. When not linked up to the tower, the chutes necessary for pouring the south wall are carried by a boom on the front end of the mixer carriage itself.



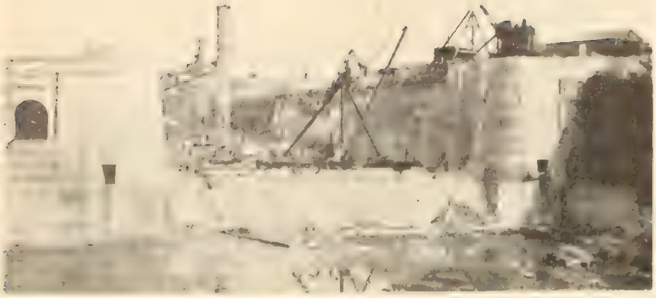
Plan of part of the drydock showing the two mixer units

During the earlier stages of construction when the dock floor was being poured, a line gate was introduced between the mixer and the tower to which an Insley 40' counterweight chute was attached, so covering a large area of the floor pour from one position.

Cable suspended over near wall carrying chutes pouring this wall through line gate directly below mixer

Each tower is equipped with the Insley quick shift gear, a 40 ft. open steel boom and a top receiving hopper, also a one yard Insley roller hoist bucket. The tower, which is operated by 15 h.p. motor drive Clyde hoist, is so located that it reaches, with the least possible amount of chutes, all parts of the north wall of the dock and was used both with

No. 2 mixer layout showing gravel storage in rear of mixer, travelling derrick and cement car. Chutes are arranged to pour near wall through line gate and the floor with counterweight chute, and are ready to connect to travelling tower for pouring opposite wall of dock.



No. 1 plant pouring both dock walls near the entrance. No. 2 plant pouring inner end of dock

Completed entrance of drydock with No. 1 and 2 towers in the background pouring the far (north) wall of the dock

and without the 40 ft. counter weight chute. When it was desired to reach a considerable extent of this wall from one position of the tower, a wire was suspended over the wall in a similar manner to the layout already described for the south wall, and distribution in this wall was obtained by suspending a line of chutes from this wire to the different sections of the wall adjacent to the tower. With this latter layout, 180 feet of the north wall could be reached from the one tower position, but it necessitated more handling of chute than when using the counterweight section only with the tower.

To allow of moving the mixer and tower without dismantling the connecting and pouring chutes, the tower was trussed both ways at each of the four corners, extension timbers were put on the carriage, to the outer end of which the top and intermediate tower guy wires were attached, and the cross cable, carrying the connecting chutes, was attached to the trussed tower itself. When moved to a new position, the tower was secured with guys to anchorages in and beyond the walls.

45,000 Yards Poured in Five Months

Active concrete operations were begun with the two completed units about June 15 last. The season has been an unusually wet and unfavorable one for this work, but between June 15 and November 15 approximately 45,000 yards of concrete were poured by these two units. The best single day's work run by one unit was about 400 yards, all of which was handled without any trouble through the tower, but much greater output could have been obtained by this plant had the wall sections been heavier and so less delay occasioned through waiting on forms.

Messrs. C. D. McGuire and N. K. Cameron, who have done considerable concrete work on the Welland ship canal and the Trent and St. Lawrence canals for the federal government, were retained by the St. John Drydock & Shipbuilding Company Limited, as concrete specialists to direct these concrete operations and the rapid progress made in completing this 600 foot section of the dry dock in six months, as well as the very satisfactory performance of the plant layout as above described, reflect great credit on the ability of Messrs. McGuire and Cameron as concrete contractors.

A total of $1,167,529 in building permits were issued in Port Arthur during 1922. This is the largest total since 1917. The figures for last year were $113,-

Letters to the Editor

Apprentice Question is a Live Issue

Sarnia, Ont., Dec. 26, 1922

Editor, "Contract Record."

The apprentice question, as outlined by Mr. J. M. Pigott in your issue of December 20, is something that should interest every contractor in the province of Ontario.

There is a demand for more buildings of every class and some statisticians say there are 24 per cent fewer brick and stone masons in the country than in 1910. In 1914 there were only 5 skilled mechanics to do a certain building and today we only have 4 men to do 4 times as much building.

Some American cities have organized citizens' committees to assist the contractors to train mechanics for the building trades.

I believe that if this question can be brought before the provincial and federal governments, they would be only too willing to assist the second largest and most important industry in the country.

The apprentice question is a live issue at the coming convention of the Builders' & Supply Association at London, Ont., on January 23, 24 and 25, and every contractor in Ontario should make an effort to attend and present his views.

Yours truly
Norris E. Gibb.

Mr. Pigott's Apprenticeship Scheme

Toronto, Dec., 30, 1922

Editor, "Contract Record."

Re article by Mr. J. M. Pigott, on "How Can More Skilled Mechanics be Obtained?" which was published in your issue of Dec. 20.

Briefly, everyone connected with the building trades knows that there is a scarcity of first-class bricklayers, plasterers and carpenters—more particularly the first two,—and it is urgent that something be done to relieve the situation. I believe Mr. Pigott's scheme is the best that so far has been suggested.

Yours truly,
John V. Gray.
John V. Gray Construction Co., Ltd.

Irrigation and Drainage in the Prairies

By E. F. Drake
Director, Reclamation Service,
Dept. of the Interior
Ottawa

Part 2—Drainage

In the southern parts of Alberta and Saskatchewan so little rain falls that to secure good harvests irrigation is a practical necessity during most years. On the other hand, in the northern parts of these provinces and in Manitoba there are in certain districts swamps and muskeg areas requiring drainage. These swampy areas are not due, as might be supposed, to excessive rainfall but are largely the result of poor surface drainage. Thus, two problems present themselves for solution: 1. Irrigation and 2. Drainage. The first problem was discussed in the last issue, while the second is treated in the article herewith.

It was natural that the drier portions of the West should have been the first to be settled and therefore that the demand for irrigation in the semi-arid tract should have preceded by a number of years the demand for drainage of wet areas in the north. It is only within the past ten years that there has developed an appreciable demand for drainage, and it was not until 1919 that the Drainage Division of the Reclamation Service was organized to carry on a systematic programme of surveys for the reclamation of Dominion lands now unsuitable for settlement on account of their wet or flooded condition.

Four Classes of Land that Require Drainage

Lands requiring drainage may be divided into four principal classes:

(a) Lands bare of vegetation—The beds of lakes and sloughs deep enough to prevent the growth of rushes, reeds, and grasses. The feasibility of reclaiming such lands is dependent upon the cost of drainage works, for as soon as drained they are usually ready for seeding without waste of time or expenditure of labour in clearing.

(b) Wild hay lands—Permanently or periodically flooded lands such as occur around the margins of lakes or in beaver meadows. Areas of this kind are commonly admirably adapted to and susceptible of irrigation or spring flooding after drainage by the construction of hold-up gates at the outlet.

(c) Floating bogs—Lands permanently wet and supporting a growth of flags, rushes, and water grasses, the decayed remains of which frequently cause the formation of floating bogs. The reclamation of areas of this kind involves drainage first and then the removal of the mat of vegetation, which is usually a difficult process.

(d) Muskegs—Wet lands, the surface of which is covered by sphagnum moss for a depth of one or two to eight or ten feet. Muskegs hundreds of miles in extent occupy a large portion of the northern parts of the prairie provinces. They are very difficult to reclaim because of the capacity of the moss to hold water and the difficulty of destroying this growth after drainage. Moreover, the mineral soil underlying the moss is frequently of low fertility. Because of these conditions it is not advisable to investigate large areas of this kind, at least until considerable experimental work has been done on smaller areas to determine the most effective and economical methods of removing the moss growth.

Although there are immense areas of good agricultural land close to railways which could be drained at reasonable cost, there is no immediate prospect of any construction work being undertaken by the Reclamation Service in addition to what is being done at present to reclaim Waterhen lake and marsh, described below. Until the people of the West realize the need and press for the reclamation of these lands which are now worse than useless, it is not to be expected that the Federal government will commit itself to any more progressive policy than that of preparing by means of surveys for the time when the drainage of vacant Dominion lands will be an urgent necessity.

Space will not permit of full particulars being given regarding the many projects investigated, but an idea of the size and importance of some of these may be obtained from the following brief descriptions.

Rocky Mountain House Project

This comprises 25,000 acres, near Rocky Mountain House, Alberta, immediately south of the Canadian Pacific Railway. The cost of drainage is estimated at $6.34 per acre.

Excavation	$122,000
Structures, right of way, clearing, etc.	36,396
Total	$158,396

Carrot River Triangle Project

The district known as the Carrot River Triangle comprises an area of over 700,000 acres of submerged and periodically flooded lands forming an irregular triangle, having the Saskatchewan river as its north side, the Carrot river as its south side, and the Sipanok channel, an overflow channel leading from the Saskatchewan river to the Carrot river, as its base. The Pas, Manitoba, is situated at the apex of the triangle. It is expected that final surveys of this district will be completed this winter and that these will show that the area can be economically drained by means of dyking and pumping systems. The construction of the project, if carried out, will be an immense undertaking, exceeding in magnitude anything of its kind ever undertaken on this continent.

A tentative estimate of cost was made last year and is quoted below:

Clearing, 3,542 acres @ $25 per acre	$ 88,550.00
Grubbing, 3,220 acres @ $40 per acre	128,800.00
Ploughing, 1,408 acres @ $4 per acre	5,632.00
Levees, Carrot river, 3,809,800 cu. yards @ 20 cents	761,960.00

Levees, Saskatchewan river, 4,622,000 cu. yds. @ 20 cents	924,400.00
Interior drainage canals and laterals, 14,390,500 cu. yds. @ 20 cents	2,878,100.00
Pumping plants, including installation, and pumping houses 6,750 h.p.	1,475,000.00
Engineering and contingencies	626,244.00
Total approximate cost	$6,888,686.00

Total acres to be reclaimed, 704,000
Approximate cost per acre for reclamation, $9.78

Moose Range Centre Project

The Moose Range Centre District, which comprises about 102,700 acres, 54,000 acres of which are Crown land; lies between the Carrot and Saskatchewan rivers in townships 49 and 50, ranges 11, 12, and 13, west of the 2nd meridian. It is by far the most attractive project for immediate development so far investigated. The soil is excellent, the cost of reclamation will be comparatively low and the settlers already in the district are strongly in favour of drainage, which will greately enhance the value of their lands while at the same time making productive a large area that now retards the development of the district.

The cost has been estimated at about $2.60 per acre, as follows:

Excavation	$185,727
Structures, clearing, right of way, engineering, etc.	77,816
Total	$263,543

Waterhen Lake Construction

As an experiment in the drainage of Dominion lands the Reclamation Service undertook to construct works to reclaim Waterhen lake and marsh, comprising an area of about 12,000 acres, near Kinistino, Saskatchewan. The contract for the works was awarded to the Lount Engineering Company.

Construction was commenced on May 19th, 1921, as soon as the ground was sufficiently thawed to permit digging. The project involved the excavation of 660,000 cubic yards of earth, the greater part of which was taken out by dredge and drag line, at a contract price of 21.9 cents per cubic yard.

The machines employed on the work consisted of two Lidgerwood drag lines of two yards capacity and 60 foot booms, one Lount caterpillar drag line of one yard capacity, and one Bay City floating dredge of one and a quarter yard capacity.

The Type of Equipment and Methods Used

For many years prior to 1921 the lake averaged about three feet in depth and the marsh lands surrounding it were dry and firm enough to permit excavation by drag line on pads. The spring of 1921, however, was ushered in by floods exceeding anything known in the past forty years. The marsh lands became floating bogs and the lake increased in depth to six feet in the deeper parts. While the floating dredge could be used on the lake work a lower elevation of the lake level would have been much more convenient. This machine capsized in about ten feet of water owing to the carelessness of the operator and a month was lost before it could be refloated. The drag line working on the main canal where there was a firm bottom made satisfactory progress but working upstream the big flow of water at a low velocity caused considerable silting in the excavated channel and the plan had to be adopted of cutting out half the channel, working upstream, then returning and excavating the residue including the silt. One drag line was set to work on the marsh canal and encountered so many difficulties, owing largely to the boggy ground and soupy condition of the material, that it was found economical to replace it by the Bay City floating dredge that had been used in the lake work.

The work was brought to a standstill on November 11th, 1921, on account of the freeze-up. On May 10th following, as soon as conditions were favourable, the machine work recommenced where it was discontinued the previous fall and the whole of the main canal and laterals were finished by October 3rd, 1922. The work in the marsh that had to be abandoned by the drag line was finished by the floating dredge without difficulty.

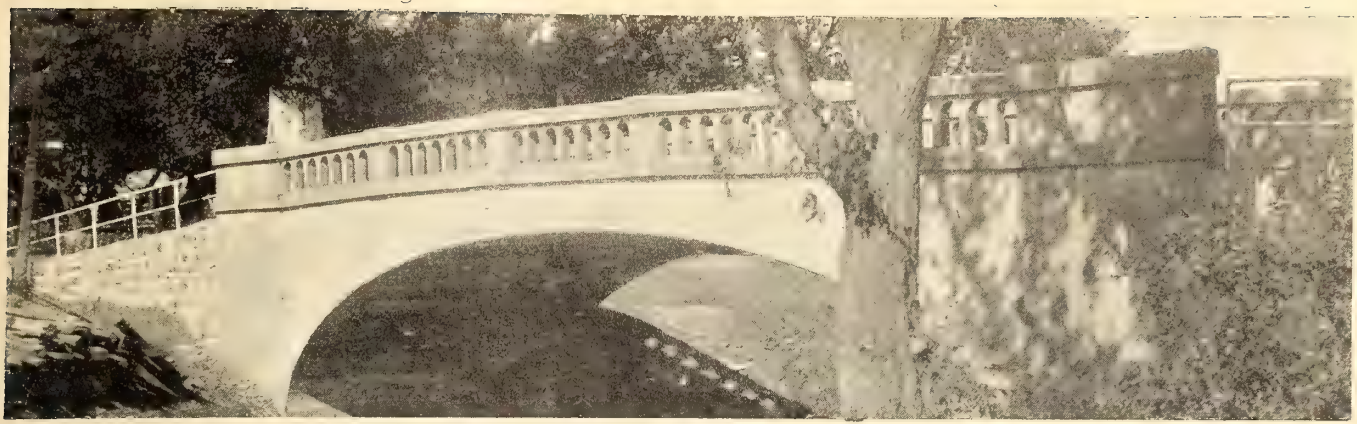
A dragline excavator with a 100 ft. boom and a 4¼ yd. bucket making the inlet cut to Keho reservoir

Floating Dredge Gives Good Service

For this class of work the floating dredge has given the best service. On firm ground the Lount caterpillar drag line made considerably better progress than the other drag lines during the actual time spent in working, although the bucket was only one yard capacity. However, the machine continually required repairs as the work was too heavy for the design. This machine has a great advantage over the others in mobility as with the caterpillar tread it can be moved from place to place quickly and without dissembling.

The completion of the main canals and laterals has already resulted in such a drying up of the lake and marsh bed that a great portion of the former is ready for seeding grass and the latter for the growing of wild hay. The project will be completed during the summer of 1923 by the excavation of lateral drains and the building of dykes and hold-up gates, after which the land will be sold at public auction or be made available for settlement by returned soldiers.

It was announced recently that the Bathurst Company, Limited, Bathurst, N. B., a manufacturer of spruce lumber sulphite and sulphate pulp, had decided to extend its present manufacturing facilities to include the annual production of 15,000 tons of newsprint paper, thus making the company the first producer of newsprint in the Maritime Provinces.



A reinforced concrete arch bridge at St. Roch des Aulnaies

Bridge Building is Active in Quebec

Fifty-Five Structures Have Been Built During the Past Fiscal Year—The Types of Bridges that Are Current in the Province —The Contract Procedure and Apportionment of Cost

By F. B. PAINCHAUD
Assistant Chief Engineer, Dept. of Public Works and Labor, Quebec

About fifty-five bridges have been built in the province of Quebec under the supervision of the Department of Public Works and Labour of the provincial government during the past fiscal year (June 1921 to June 1922). These bridges are all permanent structures and are divided between the following types according to the length of span:

(1) Reinforced concrete slab on concrete abutments for spans up to 14 feet.

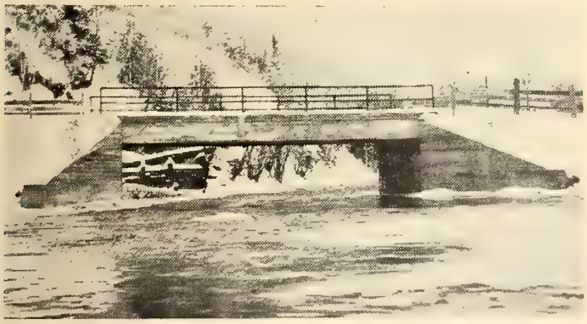
(2) Concrete and steel beam bridges for spans from 15 to 40 feet.

(3) Steel trusses or concrete arches.

(4) Steel viaducts.

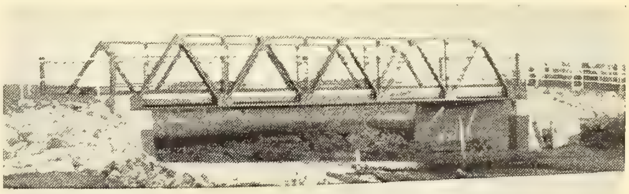
Beam Bridges

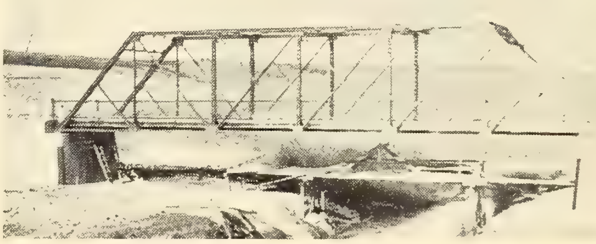
Beam bridges consist essentially of steel I-beams encased in concrete and resting on concrete abutments. The beams carry a reinforced concrete floor with a gravel or macadam covering which counteracts the impact stresses and permits a continuous road surface of the same metal. Fig. 1 shows a cross-section of a typical floor system for beam bridges. The choice of the particular type of reinforcement to be adopted is left to the contractor, but must be approved by the department and the specifications only state the effective cross-sectional area of reinforcement required. Steel fabric such as "Clinton electrically welded wire mesh," "triangle mesh" or "expanded metal" is preferred to rods as the chances of unequal spacing are thus eliminated.



A typical beam bridge in the province of Quebec

This type of bridge for short spans is giving very satisfactory results and prevents many errors which would likely occur owing to the unfortunate lack of experience in bridge building on the part of some contractors if regular reinforced concrete beams were used.





Examples of truss bridges. These are in Champlain county

In one instance, some years ago a beam bridge had to be built over a small river which in springtime would rise and flood the surrounding country, the road and the bridge itself interrupting traffic for a short period of time. For some reason or other the question of raising the level of the bridge could not be considered and it had to be designed to meet these unusual requirements. The concrete slab was made solid the whole depth of the steel beams and reinforced both at the top and bottom of beams; the lower end of the pipe railing posts were fitted with a special designed attachment allowing the removal of the handrails in spring to prevent them from being torn down by drifting ice when the water rose above the bridge.

Steel Superstructures

They are designed in accordance with the specifications of the Engineering Institute of Canada for highway bridges supplemented by the department's specifications. As to loading they are divided into three classes: A, B. and C.

Class A bridges are used on trunk roads subject to heavy traffic or where heavy traffic may be expected in the future and structures of this class are designed for a uniform line load of 100 pounds per square foot for spans 100 feet long or less, gradually decreasing to 80 pounds for spans 200 feet long and over; or for a 15-ton auto-truck.

Class B is for roads of secondary importance and calls for a line load of 80 pounds decreasing to 60 pounds for spans 200 feet and over, or a 10-ton auto-truck.

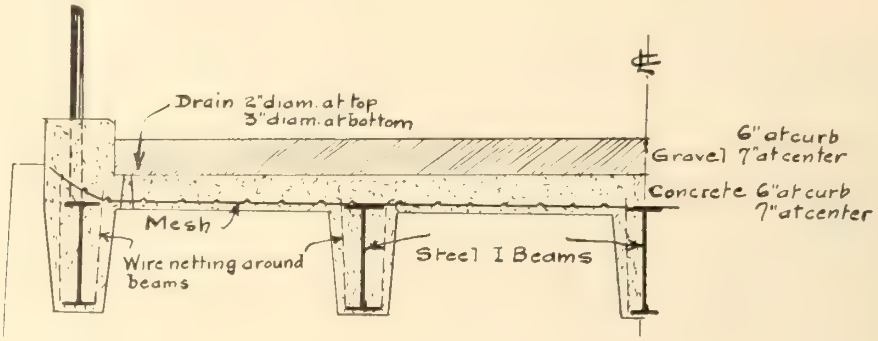
Class C is only used in remote districts. The uniform load is this case is 70 pounds for spans 50 feet long or less decreasing to 40 pounds per square foot for spans 200 feet long and over, or for an 8-ton auto-truck.

The systems of trusses commonly used are the "Pony Warren" for spans up to 88 feet and the "Pratt," "Baltimore" and subdivided Pratt with curved top chords for larger spans. However, an exception to our present practice of using open web trusses is to be found in the case of the Isle Perrot bridge which will consist of seventy steel plate girder spans forming a total length of 1,389′ 6″ between abutments. This bridge will span the Ottawa river between Vaudreuil and Isle Perrot and is actually under construction by the Dufresne Construction Co., of Montreal. The contract for the steel has been awarded to the Dominion Bridge Co.

Contract Procedure

The design of the superstructure is left, as a rule to the various companies which submit their own stress sheets for approval when tendering. Our engineers prepare detail plans and specifications for the substructure and approaches and check the stress sheets, and detail plans of steel work submitted by the company which has been awarded the contract.

The government does not build these bridges for the municipalities as is sometimes thought but merely helps the municipalities towards the construction (exception being made, however, for the Batiscau River bridge and the Vaudreuil and Isle Perrot bridge which are built entirely with government funds). The call for tenders is made by the municipalities and the various bids which have been received are referred to the department for a report. The contract is generally awarded for a lump sum price but the tenderer is requested on the form of tender to give his unit prices for the various items in order to facilitate the settlement in case of an increase or reduction of the work. The municipality appoints a local inspector who keeps the department posted as to progress of the work and an engineer is sent on the job whenever necessary. Final inspection is also left to the engineers who report to the chief engineer for acceptance of the work.



Half cross section of a typical beam bridge floor

Tarvia or Asphalt Wearing Surface

Bridges built a certain number of years ago were not designed with provision for a concrete floor as is now done and the maintenance of wooden floors becomes a tedious and expensive job for the interested parties. On several occasions the department has tried recently to remedy this situation by renewing these floors with treated lumber and adding, as wearing surface, a coating of asphalt or tarvia which preserves the surface of the planks against wear and also greatly reduces vibration of the bridge.

The recently completed bridge over the Batiscan river

Some Complicated Foundation Work for the Montreal Court House

Foundation Included Some Heavy Piers Constructed in Caissons, Footings on Steel Pipe Piles and Spread Footings on Soil—No Mechanical Equipment Used for Excavation—Removal of 2000 yds. of Old Heavy Masonry—Several Features of Interest in the Construction of a Large Building

The present Court-House of Montreal is a large and beautiful building on the west side of Jacques Cartier Square across from the old city hall and having its main entrance fronting on Notre Dame St. In more open surroundings it would be a very imposing structure but it has been added to from time to time on the west side until its original beauty has been almost totally lost. Only from the big open space of Champ de Mars, at the rear, can one really appreciate its size and beauty. In looking at it from the front or Notre Dame St. side the observer's attention is distracted by the newer and taller surrounding buildings and the incessant rush of traffic along the street in front of the building.

For some time past representations had been made to the Quebec Legislature to extend the court-house facilities. As the city has increased very rapidly in population during the past decade it became more and more evident that the proper administration of justice could not be obtained in the present Court-House.

These representations finally became so insistent and so general that the legislature at a recent session finally took a definite action and passed the necessary legislation to allow of an immediate start being made on a considerable extension.

A Commission of Architects

A commission of architects was appointed as follows: Mr. L. A. Amos, Mr. Ernest Cormier and Mr. Charles J. Saxe. These three men are highly respected in the community for their integrity and ability and the fusion of their different ideas will result in an imposing and efficient building.

The site for the new extension was chosen without much difficulty or delay as it was decided upon as being more suitable and convenient to centralize this department of the government work in as small an area as possible. With this idea in mind it was decided to place the new building on the opposite side of Notre Dame St. and very slightly to the west of the present building, the east side of the new extension being approximately in line with the west side of the original court-house. The choice was simplified to some extent by the fact that the buildings here were much older and therefore not so valuable. Also the area and shape of this particular site were found to be of a very convenient nature. It is bounded on all four sides by city streets, Notre Dame to the north; St. Gabriel to the west; Ste. Therese to the south and St. Vincent to the east. The main entrance will face on Notre Dame St.

The location having been decided upon, negotiations were soon started to buy the various properties included in the area and in all but one or two isolated cases this was easily arranged. The work of demolishing was commenced as soon as the tenants of the various buildings would surrender their leases and seek new quarters. This work was done under a separate contract, given to the Major Co., Limited, and called for complete demolition to ground or street level and the consequent disposal of the debris. It is interesting to note here that this block of land used to be within the limits of the once fortified area of Montreal and some of the foundations uncovered were very old. The walls in some cases were 4 feet thick and these supported heavy stone, arched roofs 2 feet thick at the crown—a type of construction commonly seen in France and Belgium at the present day.

Taking out the Old Foundations

In December 1921 the Foundation Co., Limited came on the ground to commence the big task of putting in the foundations. It was part of their contract to take out the foundations of the old buildings which were below the street level—no small job as the foregoing description will indicate. There were about 2,000 cubic yards of this old stone masonry which had to be removed. It was of the dry wall type, laid without the use of mortar, and in most places could be pulled apart by hand with the help of crow-bars and picks. In some cases where the walls were heavier they were undermined by excavating on both sides and crashing the wall into these excavations by using small charges of dynamite. No mechanical equipment of any kind was used on this part of the work.

Soil Tests

While this work of taking out the foundations was going on, test pits were being dug in preparation for a series of wash borings at different points of the area covered by the building. These tests were made in the majority of cases at the places where the large peers supporting the walls and heavy interior loads were to come. One or two of the open test pits had been started previous to Dec. 1st, by the Major Co., Limited, but they had not undertaken any tests by wash borings. Fourteen accurate tests were made in all by the Foundation Co., to determine exactly the nature of the soil which would be encountered, as the contract called for the design of the foundations as well as their construction. The result of these tests showed them that the soil was not nearly of the same composition over the whole area. About 1/3 of the total area was found to be blue clay of a very unsuitable character to carry heavy concentrated loads. This was found underlying the north east corner of the building at the corner of Notre Dame and St. Vincent Street. It extended much further along Notre Dame St. than along St. Vincent St., but in neither case does any one wall altogether rest on this material. The tests over the remaining two-thirds of the area showed very satisfactory material such as sand and gravel, hard sand or, at lower elevations, shale mixed with sand. This latter material will support very heavy loads concentrated on spread footings. There was found to be a very definite dividing line between these two materials without any gradual change such as one would naturally look for. It will be pointed out later how this affected the design of the foundations. All tests were completed by the end of January, 1922.

It would probably be advisable to describe the topography of the site before going any further. The Montreal city datum is arbitrarily put at 0.00 and is 5.4 feet above the mean low water level in the harbour. Any other elevations mentioned are referred to this datum. Notre Dame St. at this point runs almost level at an average elevation of 56.0 feet. Ste. Therese St., which parallels Notre Dame St. is at elevation 40.0 and the land slopes gradually between the two streets as indicated by the two other streets named above, St. Gabriel and St. Vincent.

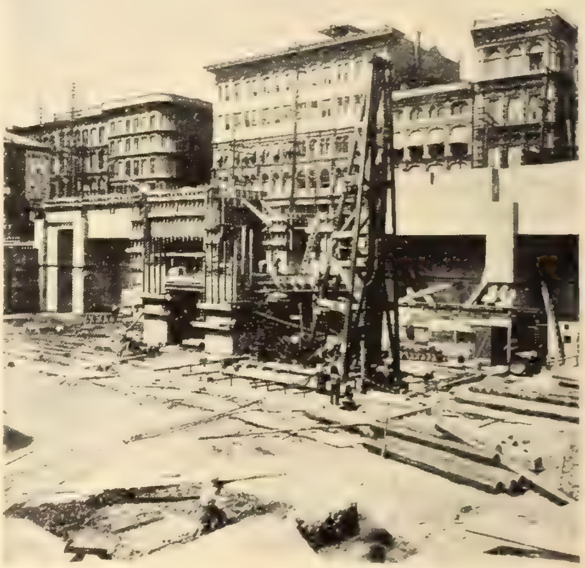
Design of Basement

The sub-basement floor was placed at elevation 26.5 by the commission of architects and occurs in the part of the building facing on Ste. Therese St. It comprises a large coal-room and janitor's quarters immediately next to the wall, while the boiler room is placed further towards the centre of the building. All other mechanical or electrical apparatus used is also placed on this level.

The basement proper is at elevation 34.5 and covers the remaining or larger part of the area of the building. It has been designed almost solely for the purpose of storing court-house records of the past, present and future. No administrative or other offices occur on this level; only a series of vaults to contain the records. There are two storeys in the basement between elevation 34.5 and the ground floor of the court-house. The intermediate floor is at elevation 48.5.

Excavation

The design of the building below ground level had been completed by the time the Foundation Company took charge of affairs in December 1921. They at once started excavation in every available place in the area of the site which wasn't occupied by the old foundations and the apparatus for making the soil tests. At the request of the Government no steam shovels or other mechanical equipment were used so as to give work to the greatest number of men which could be efficiently put on the job. This was during the time when there were a large number of men unemployed and very anxious to get work. This method of excavation was used until completion. The Foundation Company made their arrangements so that after a certain gang of men had been working for about 2 or 3 weeks they were replaced by a new bunch who had not previously been on the pay-roll. In this way a large number were given temporary employment when they most needed it. It is stated that the increased cost consequent on this method of excavation was very nominal and, when the benefits resulting are considered, entirely warranted. The work was carried on day and night by large gangs of men and teams, as many as 250 men and 90 teams being employed on one shift. The night shift was necessarily smaller as the darkness handicapped the teams in the disposal of the earth. The company states that they



General view of the foundations of the addition to the Montreal Court House, showing the concrete piers and heavy beams which support the wall and columns across the front of the building. The recesses on the tops of the piers are for the steel wall columns. The piiedriver is driving hollow steel piles, some of which may be seen in the right foreground. Cast iron pile points are stacked against the shanty.

have taken out as much as 1,100 cubic yards of material in one 24 hour shift.

The date of final completion was postponed considerably on account of the fact that the leases held on several of the buildings did not run out for some time and the tenants could not be forcibly ejected. One lease did not run out until July, 1922, but these difficulties were overcome by excavating as close to them as possible without endangering their stability. Underpinning and shoring were done in some cases to ensure this.

The total cubic yards of material excavated was approximately 4,300 which includes about 2,000 cubic yards of old masonry as previously stated. When completed to the level of the underside of the basement floor the excavation was 25 feet deep in some places, particularly along the Notre Dame St. side. Being a perpendicular cut on all sides, heavy shoring and bracing was used whenever necessary, consisting of 3″ planking in an upright position held in place by 12″ x 12″ walings. These in turn were supported by 12″ x 12″ uprights braced against anchors or dead men. It required a total of 93,000 ft. b.m. to do this, apart altogether from forms, etc.

Design of Foundations

With the information obtained from the soil tests already made the design of the foundations was completed by the time the excavation had been finished.

There are three types of foundations being used. Solid concrete piers; spread footings on pile foundations and spread footings on hard sand and gravel. The two kinds mentioned first were used to support that part of the building which overlies the unstable material found in the northeast corner of the excavation. The latter type was used on the better class of foundation material which generally covers the remainder of the site.

Fifteen heavy concrete piers were used, ten along Notre Dame St., under the wall, 3 down St. Vincent St., and two more a short distance inside the main entrance to carry the two heavy columns which go to form the rotunda. They vary in size from 8′-0″ x 17′-0″ to 6′-6″ x 6′-6″. The larger ones are under the front wall facing Notre Dame St. and the smaller ones, of which there are two, are at the back of the rotunda. The heaviest load comes on the piers at the ends of the wall fronting on Notre Dame St. The average depth of the 15 piers is 63′-0″ below the level of Notre Dame St. This brings them to elevation 63′.0—56.0=7.0′ below datum. At this level a hard, pressure-resisting substance was found, suitable for carrying heavy concentrated loads.

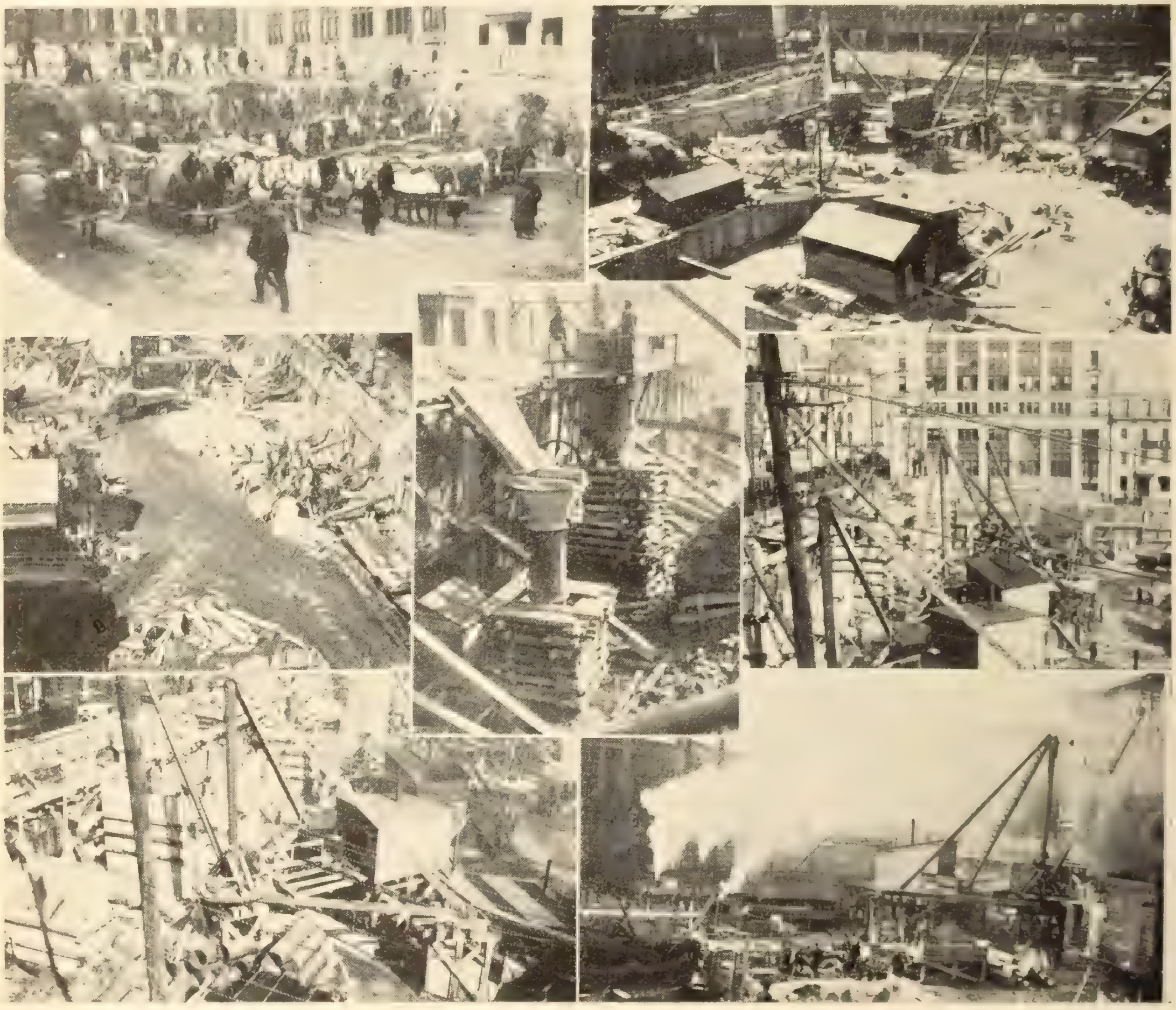
The caissons were of two different kinds depending on the size, the working chamber in the large ones being reinforced concrete cast in monolith with the sides, and the smaller ones being made of heavy timbers with 2″ sheeting on the outside. In each case a heavy angle iron was used as the cutting edge. In each case the working chamber was about 6′-0″ high to allow a man to stand upright to do more efficient work. It was thought advisable to make the working chamber of the larger caissons of concrete as the span of 17′-0″ in some cases was too great to permit of timber being used with absolute safety. Each was accurately laid out in place on the ground and then built to a height of 15′ or 20′ before any excavation was made under the cutting edge and driving started.

This method is commonly called "ditching" the caisson and particular care must be taken to see that it is started on its downward journey in a perpendicular position. The excavation was started, and continued for some distance, in the open air until water was met with in quantity, when the steel shaft was concreted in and compressed air was used to keep back the water. In this way considerable steel shaft was saved. Extra weight in the form of pig iron was symmetrically added to force the caisson down when the side friction became too great to allow it to continue under its own weight of concrete. When it had sunk a certain distance the pig iron was removed and another layer of concrete was poured and the performance was repeated. When the proper stratum of soil had been reached the caisson was enlarged at the bottom into the shape of a bell, the shaft was filled with concrete and the job was complete.

The excavation of the earth when the compression chamber was being used was handled by a tip bucket operated by a stiff legged derrick loading directly into carts. Some of the concrete in the lower part of the shaft was placed with the same bucket and derrick.

Foundation in Unstable Clay

The spread footings on pile foundations were also used in the area of unstable clay material. Steel pipe piles were driven to a certain depth, left in place and filled with concrete. The depth to which they were driven depended upon the resistance offered to the pounding. Where a certain number of blows from the hammer failed to drive them any further the pounding ceased and they were immediately filled. The piles were built in sections with a solid cast iron pointed shoe to turn aside any boulders which might deflect the pile from its upright position. A cap was placed over the top of the pipe for the hammer to strike on without deforming its circular cross-section. Sections were added as the pile was driven, thus avoiding any waste of piles. The metal used was ⅜″ steel which was found strong enough when built in circular section to resist the earth pressure long enough to allow the concrete to get its permanent set. These piles came in 3 different sizes, 10″, 12″ and 16″ diameters, the size used depending upon the nature of the resistance offered to driving and also upon the size of the load which they were intended to support. The average length of these piles in place was about 38 feet which would lead one to conclude that they had reached the pressure resisting material which was used to support the concrete piers. As stated before the depth of the excavation to basement level was about 25 feet below Notre Dame St. level. There were 219 piles used in 36 different footings mainly in the northeast corner of the excavation. When this work had been finished heavy mats of reinforced concrete were laid as footings resting on the piles. Reinforcing was of the conventional 2-way type parallel to the sides of the footing. These supported footings were designed to take the heavy interior column loads of the building without depression. The piles were designed to carry all of the column load in each particular footing and no allowance was made for the possible upward reaction of the soil against the footing itself. Pile tests were made some time before actual driving was commenced to see what ultimate load the pile would stand before settlement showed. No appreciable settlement was recorded under a loading of 45 tons per pile.



Upper left;—Shows the means adopted to excavate and the large number of men and teams employed. No mechanical equipment was used for this work. Upper right:—General view taken from south-east corner. The depression in the left foreground is the sub-basement for the boilers and coal room. The big mound of dirt just beyond is still in its original state of supporting a building. Middle left:—Shows the heavy bracing along St. Vincent St. Middle right:—Looking across the site from west to east. Three stiff-leg derricks are in operation in conjunction with caisson work. The elaborte system of holding back the earth is shown on the far side of the excavation. Lower left:—Shows the caissons well on the way and just before compressed air was used. It will be noticed that one steel shaft is already in place, but no compression chamber is on. Lower right:—A general view of the excavation. Centre:—Shows the piers in process of construction. Also the method of placing iron billets to increase the load in order to force them down

A Third Type of Foundation

The third type of foundation used was the ordinary spread footing resting directly upon the soil and reinforced in the usual way to resist the punching or bearing action of the columns. It was fortunate that this type of footing was used over the greater area of the building. As stated previously the class of soil found in the greater area of the excavation was of a pressure resisting nature. It was first discovered at a comparatively high level and continued down to a great depth increasing in resistance as lower levels were reached. They finally struck a layer of hard shale mixed with sand beyond which they didn't explore. The footings in this area only varied in size according to the load each one was designed to carry. The biggest one supports the smoke stack from the boiler room.

An Intricate Problem

An interesting and intricate engineering problem developed consequent on the discovery of two different kinds of soil. It naturally meant that the type and size of the footing would be dependent on the nature of the soil and the load on the footing. It followed from this that the upward reaction offered by the foundations had to be carefully determined, in order to be uniformly proportional to the load on them. So that if, by any chance, any settlement did take place, it would also be uniform throughout the whole building and not develop any unsightly cracks in the plaster. It says much for the efficiency of the organization of the Foundation Company when they express confidence that they have overcome this possible danger.

There are 111 spread footings in all including those which are supported on the piles.

Foundation Drainage

There is a drainage system under the basement floor and up to the foundations to carry off any seepage. Various sizes of clay pipe have been used, 4″, 6″ and 8″, all directed towards a main sump at the south side of the building. A 5 h.p. Yeomans Automatic Electrical sump pump has been installed to pump the water that collects in the sump. This is pumped into the city drain running along Ste. Therese St.

Pier Construction Above Basement Floor Level

Above basement floor level the piers have been slightly reduced in size and run up to elevation 69.5 which is ground floor level. The outside faces of the piers and the outside faces of the basement walls are in the same vertical plane. The walls are reinforced at the bottom so as to form beams from one pier to the next, and are also reinforced on outside and inside against expansion and contraction. Two heavily constructed plate girder beams span the distance between the piers which are intended to support the masonry wall and the columns. These girders are encased in concrete. There will be a stone column on each pier outside the main wall and an intermediate one between supported by the plate girder beam mentioned. Deep checks have been left in the walls at elevation 34.5 and 48.5 to take the floors of the basement. The floor at elevation 34.5 is already completed.

Method of Placing Concrete

A Smith mixer of one cubic yard capacity and operated by steam was used to mix the concrete. No spouting tower was used but runways were built all around the building on the outside of the walls and concrete buggies were used in the placing. The walls were divided into sections by bulkheaads and a triangular check inserted at each one to insure a good bond when the adjoining section was poured. As the walls and piers are very deep and of considerable volume these bulkheads were placed at frequent intervals without straining the forms as the concrete placed in this manner rose very slowly in such thick walls and the form bracing was not unusually heavy. The reinforcing was necessarily carried through the bulkhead to obtain a monolith construction of the walls. The inside form was continuous around the piers on three sides so that the piers and the walls between would be one solid mass without any distinct cleavage plane. Along the Notre Dame St. side where the walls are deep (25 feet) it was found impracticable to attempt to fill the space between the bulkheads in one shift so that placing of concrete ceased when the floor elevation of 48.5 was reached. A good bond was assured in any case by embedding a large wooded check horizontally in the concrete when pouring had been finished. It is advisable to grease this check well before doing this so that it can be taken out more easily when pouring starts again. The perpendicular steel reinforcing also helped to bind the two together to make a tight joint.

There was another Smith mixer set up in another corner of the site, and at the lower level, to mix the concrete which was put into the piles and the spread footings. The top of the concrete in the spread footings where the column castings sit is at a uniform elevation on all the footings. This elevation is 2′-4″ below the level of the basement floor at 34.5, i.e. 32.166. The reason for this is to avoid showing the lugs on the bases of the steel columns through the finished basement floor.

A Special Feature

As police court records possess considerable value as references, their preservation is an important matter which the Commission of Architects has had to consider. So they have adopted a style of construction which it is thought will guarantee the future condition of all records.

As stated elsewhere in this article all records are to be kept in vaults in the basement. The larger part of the basement is below ground level and the concrete walls would no doubt allow a dampness in spite of the usual method of waterproofing. In order to eliminate this possible condition the Commission of Architects designed an insulation chamber which insulates the whole of that part of the cellar which comes below the ground level. In other words the whole of the wall which is liable to allow dampness or seepage is protected by an outer wall 3'-0" away from it. There is a small rectangular drain in the floor of this chamber just against the outer wall which drains to the sump at the south side of the building. Thus any seepage water will be stopped by the chamber and carried into the sump. The outer wall of this chamber is of the retaining wall type, 18" thick at the bottom and 12" thick at top; and reinforced at intervals by horizontal concrete diaphragms where the height requires it. The outer wall is perpendicular on the inside and reinforced very heavily to withstand the pressure. Vents have been left at stated intervals in the inner wall leading into both floors of the basement so as to ventilate the insulation chamber. They have also placed vents at regular intervals leading from the insulation chamber up through the masonry wall to a point on the outside of the wall a short distance above the top of the concrete foundations. The insertion of these vents will assure the proper and continual ventilation of the vaults as well as of the insulation chamber.

It is interesting to note the manner in which they have supported this outer wall. At each pier and footing a 20" I-beam was cantilevered out to catch the wall, the wall itself being reinforced so as to form a beam across from one I-beam to the next and so on round the building. The floor of the chamber, not being of great weight, is simply hung by means of checks in the inner and outer walls, and reinforced at right angles to the walls. These I-beams were encased in concrete to preserve them against possible variation in soil conditions.

The Tunnel

A tunnel connects the basements of the old and new Court-Houses. It is approximately 190'-0" long and has a uniform slope down from the old Court-House to the new addition. The cross-section of this tunnel is in the form of a semi-circle resting on a rectangle. The semicircle has an inside radius of 5'-0" and an outside radius of 6'-0" and a height of 6'-0" on the inside, to the point where the semi-circular section rests. The walls of the lower section are considerably thicker at the top than at the bottim the difference being accounted for by the slope on the outside of the wall. This leaves a shelf about 2'-3" wide formed by the tops of the walls and running the whole length of the tunnel to take the steam pipes from the boiler house in the new addition into the old Court-House for heating purposes. In pouring the concrete of the tunnel, provision was made for attaching furring tile to the perpendicular walls so that they could be lined with white enamel brick up to a height that would conceal the steam pipes lying on the shelves. The whole tunnel was made as waterproof as possible by the application of a double layer of Minwax to the entire outside area of the upper section. The lower section of the tunnel was waterproofed on the inside by the same process. It was applied to the walls between the furring tile and the white enamel brick and continued unbroken across the floor of the tunnel under the floor finishing consisting of about 1½ inches of cement mortar. Thus it will be seen that an unbroken surface is presented to stop the entrance of seepage water.

Applying Minwax

The process of applying "Minwax" is somewhat as follows: a layer of asphalt is first of all applied to the concrete surface to form a binding layer for the Minwax. The Minwax itself appears like long strings of cotton soaked in asphalt. It is applied directly to the asphalt and then another protection coat of asphalt is applied. It is claimed that it has the supreme advantage of following the expansion and contraction of the concrete without cracking or breaking.

The earth was excavated partly by open cut and partly by tunnelling. They had to tunnel under Notre Dame St. and another short piece under two big trees which they wanted to preserve. The usual method of soft ground tunnelling was used, namely to support the roof and sides by heavy sheeting which was placed in sections. One complete section was always in advance of the face cut of the tunnel to obviate the danger of a cave-in. By adopting this precaution no unusual incident occurred during the work.

Superstructure

The following brief description of the superstructure was obtained by the Contract Record's Montreal representative from the offices of the Commission of Architects. The Commission has designed the interiors with two objects in view, namely, to economize on the available space and to make the general impression as pleasing as possible. From the following description it will be seen that they have well attained their combined objectives.

The framework from elevation 34.5 to the roof beams is of structural steel encased in concrete to make it fireproof. The floors will be of reinforced concrete throughout with hardwood covering or other material depending upon the proposed use of the rooms. The outside walls are to be of stone masonry with brick backing masonry. The Commission intends asking for masonry tenders in granite and 2 different classes of limestone. This will furnish them complete comparative costs so that they may choose the most economical, and not necessarily the cheapest. A beautifully designed and executed building is sufficient justification for a slight extra initial expense. The interior partition walls will be of common brick covered with a finishing material to suit the particular requirements of the rooms. In most cases this will be plaster but it is also proposed to use white enamel brick in some rooms. The main hallway which runs parallel to the front of the building will be decorated with marble The window casements and sash will be of steel.

Interior Design

The basement at elevation 34.5 is to be used exclusively for the storage of records and archives, except for a space at the rear of the building which is to be reserved for a prisoners' detention room, both male and female. This latter space is to be entirely enclosed by heavy partition walls effectually separating it from the rest of the basement. This detention room has a kitchen and other necessary conveniences attached to it for the use of prisoners only. It has been designed with the intention of doing away with the frequent and unnecessary transportation of prisoners to and fro between the court-house and the Bordeaux Jail, with the accompanying danger that some may escape. Thus when a prisoner leaves the jail at Bordeaux he is held at the Court-House until his case is finally settled. Another area at this same level not available for vaults is the space taken up by the boilers and coal room which are adjoining the detention room.

The floor above the basement which is at elevation 48.5 is taken up wholly by the Revenue department and the Registry office for the Montreal District except for an area near the centre front for the installation of lavatories, etc. There are two secondary entrances leading onto this floor, one from St. Vincent St. and one from St. Gabriel St. These two entrances offer a more direct access to the two departments, for those on business outside the courts.

Handsome Rotunda

The main floor is about 12 or 13 feet above the elevation of Notre Dame St. and is reached directly by using the main entrance. As you step inside the portals you find yourself in a rotunda of handsome design and proportions. A vestibule or short hallway opposite the door conducts you into the main hallway or concourse which runs in a direction at right angles to that which you have taken to reach it. It does not run the full width of the building being shorter by the width of 2 court rooms, one at either end between the concourse and the outer walls. A secondary corridor turns off each end of the main concourse and runs right through to the rear wall of the building on Ste. Therese St. Across the main concourse directly opposite the main entrance is a large room which looks like the interior of a bank, with long counters one on each side. This is where the administrative officials of the Court-House have their offices, and it is located in such a position as to be readily accessible to each court room. There is a light and air shaft on each side of the room which continues down to the elevation of the floor below. Being a square building this is the only way to provide light and air to the offices in the centre. There are 7 court rooms on the main floor, 2 preliminary enquiry court rooms facing Notre Dame St., and 5 police courts facing on St. Vincent St. and St. Gabriel St. Adjoining the two preliminary enquiry court-rooms are detention rooms for both male and female prisoners. Also adjoining all court-rooms are retiring rooms for the judges with offices and necessary conveniences. At the rear of the building facing on St. Therese St., is the High Constable's department consisting of public and private offices, vaults and other conveniences.

On the first floor up is a large room which is to be used as the Criminal Court of Kings Bench. This room is reached by a monumental iron stair case, which starts from either side of the entrance to the large main office on the floor below.

The floors above the main court-room are occupied by Government offices of the various departments and for the Provincial Cabinet Ministers. There is also a dormitory for the use of the Jury during the trials in the Court of Kings Bench. In the latter case everything has been provided to make their enforced confinement as pleasant as possible. This dormitory is reached by a stairway leading out of the back of the court-room at the opposite end from the public entrance. The judge, jury, lawyers, witness and all those involved in the case retire or enter the room by special entrances at the back of the court. Thus the general public is unable to come into contact with those interested more directly in the case.

There will be two elevators running the full height of the building from sub-basement at elevation 34.5 to the top floor. These are to be placed just inside and directly opposite the secondary entrances on St. Gabriel St. and St. Vincent St. A stairway follows them up throughout the full height, and in the same well.

The Dominion Bridge Co., of Lachine, has already secured the contract for the fabrication and erection of the structural steel framework and expect to start the work of erecting it in a very short time. This will be quite separate from the outside walls, and there will be no wall bearing beams.

At the time of writing tenders have not been called for on the remainder of the building but are expected to be in the Commission's hands in a very short time. It is doubtful if general work on the superstructure, apart from the steel, will be started before the coming spring. The magnitude and importance of the work require careful deliberation as to procedure, in order that no item of economy and efficiency may be overlooked.

When completed it is within reason to say that Montreal will not possess a more imposing nor a more efficient building and at the same time one that is more universally needed.

Some Important Points in the Construction of Concrete Block Houses

A Simple Type of Construction Provided that Proper Attention is Paid to Some Essential Points—Features Where Concrete is Found to Have Advantages

The subject of the weekly house suggestion in this issue is a concrete block residence stuccoed on the outside. The concrete house of this kind is simple and easy to build provided due care and attention is paid to a few essential points.

First of all, the wall should stand on a firm and sufficient foundation.

Joists will rest on the top of the ledge formed by the change in thickness from 12 inches for the cellar walls to 8 inches for the walls of the upper part of the building. Where joists are built into the upper 8 inch wall special joist blocks are placed to receive the ends and the joists themselves are set in the slots so formed and "fire cut" at the end.

Lintels in concrete block walls should be of reinforced concrete. Some builders prefer to cast these on the ground and hoist and set them in place. Others place temporary wood forms at the top of the openings and fill them with concrete in the walls.

Window sills should be of precast concrete. The slip sill is the quickest and most economical but many architects prefer lug sills from the standpoint of appearance.

Window jambs should be recessed in order to properly bed the window frame and prevent air leakage around. This is essential in all good masonry construction of concrete, stone, or brick, but in cheaper houses it is often disregarded and the jambs are built straight.

Roof plates should be 8 inches wide instead of 2 x 6 or 2 x 4 in order to cover the open core holes in the block and prevent air currents. They can be fastened down by bolts set in the cores of the block and filled around with concrete.

Stucco should start above the grade line; below this the cement finish should be trowelled smooth.

Eaves should be fire protected with metal lath and cement stucco.

Gable rakes can be built up with special triangular block or else by filling the raking steps with concrete as the walls are built up.

Chimney flashings require a narrow strip of metal lath to secure the stucco over them.

Construction Details

The following notes regarding the details of concrete houses are supplied by the Portland Cement Association and apply to houses of the type shown in the weekly house suggestion on another page.

Walls—The block should always be laid in portland cement mortar in order to join the individual units perfectly into one solid structure.

Rough, unsurfaced concrete block furnish a perfect backing for portland cement stucco. The two materials—block and stucco—are of almost identical composition and adhesion is perfect.

Insulation—The inside of the walls should be furred, lathed, and plastered, the furring and lathing providing an insulation air space that will prevent the sweating likely to occur in most climates on solid masonry walls built without insulation. So treated, the concrete house is dry and comfortable and remarkably economical in fuel requirements.

Economy—The economy of concrete-stucco construction is surprising considering the strength, fire resistance and permanence of the material. Concrete block and portland cement stucco construction is not recommended as a low cost substitute, but rather as a superior fire-resistive, maintenance-free, permanent material obtainable at only a small increase in cost above that of construction lacking these qualities.

Rigidity—Concrete block and stucco walls are rigid. They cannot warp, shrink, or sag and are to the highest degree weatherproof and fire-resistive. Rigid wall construction reduces repairs, for it gives stiffness and stability to the house, preventing the racking in high winds that cause floor joints to open doors to jam, plaster to crack and other deterioration to start.

Basements—the time to make a basement wall watertight is when it is being built. It costs less to build a watertight concrete wall than to repair a leaky one. Concrete foundations are either placed in forms on the job or by laying up concrete block. Both types are dependable if constructed with ordinary good workmanship.

In order to be absolutely watertight in wet soils the concrete block wall must be laid upon rich portland cement mortar and the exterior surface should be covered with a plastic coat of the same material. The mortar should be made not leaner than one part of cement to three parts of sand. Joints must be well filled and the vertical joints buttered at both ends. In localities where ground water is likely to rise above the cellar floor two coats of hot tar may be mopped on the exterior from the cellar floor level up to finished grade as an additional precaution.

Partitions in Cellars—Basement partitions of concrete block are suggested, although if the foundation walls are built of monolithic concrete, basement partitions may be placed in the same manner at the same time. Such partitions afford fireproof enclosures for heating equipment and fuel, keep steam and moisture within the laundry and provide more rigid support for the first floor. Coal dust and boiler ashes are confined and the fire risk is greatly minimized. Rigid support given to the floors insures that there will be no settlement of the interior with consequent cracking of plaster and loosening of the interior trim. The furnace and fuel rooms are designed to have ceilings of metal lath covered with portland cement plaster. Recent tests have shown that ceilings so protected will resist a fire of more than average intensity for over one hour, thus adding very greatly to the fire protection of the house as in these rooms fires are most likely to start. If concrete floors are used, metal lath is of course dispensed with.

Floors—The many obvious advantages of concrete cellar floors make them the unquestioned choice in all good houses. There are even better reasons for building the upper floors of reinforced concrete construction and the practice is growing rapidly. Experience in modern residences has shown that concrete floors are not cold as commonly supposed. Over a heated basement the concrete floor has been found to hold the warmth in the winter time like the stones of a fireless cooker, actually feeling warmer than a wood floor. The concrete floor finished in terrazzo or in enamel paint, or with tile borders, gives a pleasing and palatial effect at a cost hardly exceeding that of a good hardwood floor.

Concrete Roofing—Concrete roofing tile are for sale in many cities at a cost which makes them economical for even the smallest house. The permanent and fire-resistive qualities given to the roof, are worth many times the cost and the building is given a more substantial and finished appearance.

Imperial Oil Ltd. Have Developed Industrial Townsite in British Columbia

An interesting development is that of the Imperial Oil Limited's townsite at Ioco, B.C., referred to briefly in our housing review in last week's special annual review number of the "Contract Record." In that article we showed a bird's eye view of the townsite. Herewith we are showing a closer view of a few of the town's well built houses and the fine school. A brief history of the development of the community follows.

In 1920 the Imperial Oil, Limited, by way of starting a townsite in connection with their refinery at Ioco, B.C., secured a twenty-two acre tract of land about a quarter of a mile east of the refinery. After clearing, the land was laid out in streets and lots, all of which have an area of 50′ x 120′, and these lots were sold to the employees. A modern system of sewage on the septic system and a 6″ water line to supply the town were installed.

Commencing in 1920 the company loaned the employees who had secured lots the money to build, the latter undertaking to make monthly payments in return over a period of twenty years.

During the first year the ground was cleared, streets laid out, and four houses built. In 1921 the building contract was let to the Dominion Construction Co. and forty houses were erected and in addition fifteen houses were moved from the refinery to new locations on the townsite.

During the present year nineteen new houses have been finished making a total of seventy-eight comfortable modern dwellings.

The provincial government has erected a standard rural school capable of accommodating one hundred children and this with a community hall of 40 x 80 ft. for dances and meetings, a general store, post office, drug store, and poolroom, all go to complete a very modern, healthy and picturesque town. Electric light has been installed for lighting the houses and streets.

Machinery & Equipment

Striking Developments in Power Shovel Design

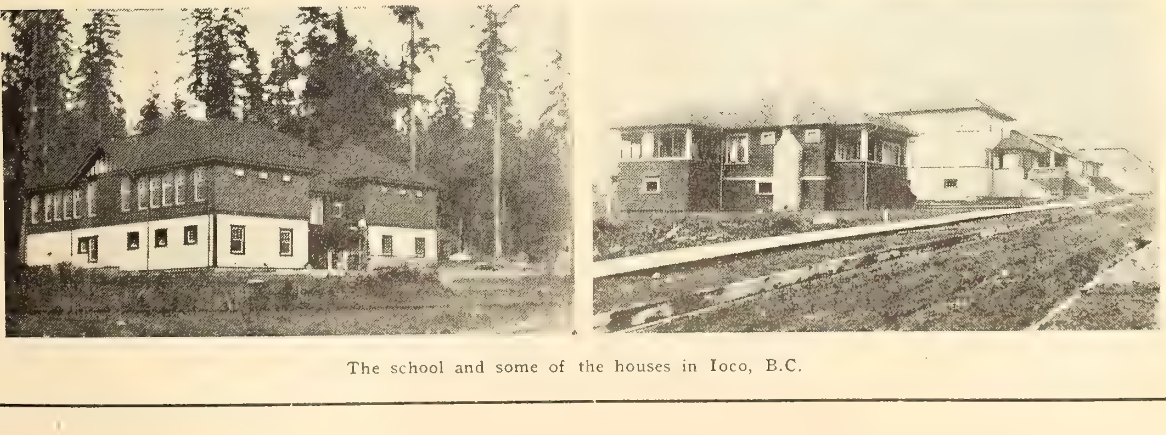
By B. Van Brunt, Bucyrus Co.

There are some quite well-marked trends along certain lines of excavating machinery. In the first place perhaps the most marked is the use of that type of small revolving shovel which is universal in its application. By that we mean a machine which, by the substitution of the proper boom and bucket equipment, etc., may be converted for use as a standard shovel, a shovel for extra high lifts, a shovel for sewer excavation, a clam shell excavator, a dragline excavator or a crane. The tremendous advantage of such a machine, which opens an almost limitless field in its application, is at once obvious.

The Bucyrus Company has recently developed a complete line of small machines of this type, the smallest being their 20-B Bullseye machine which as a shovel is equipped with a 3/4 yard dipper. The next size larger is known as the 30-B which is of an intermediate size and the largest of the three, the 50-B, which is regularly equipped with a 1-3/4 yard dipper. All of these shovels are regularly offered mounted on caterpillars which mounting has come to be practically universal among contractors, quarries, etc.

Gasoline Operated Shovels More Popular

Another striking development and one which is bound to increase considerably, is the use of gasoline operated shovels and draglines. The gasoline dragline has been successfully developed for a good many years, but on account of certain mechanical difficulties in transmitting the power to the trust the gasoline shovel has been slower in coming. During the past year the Bucyrus Company has announced such



The school and some of the houses in Ioco, B.C.

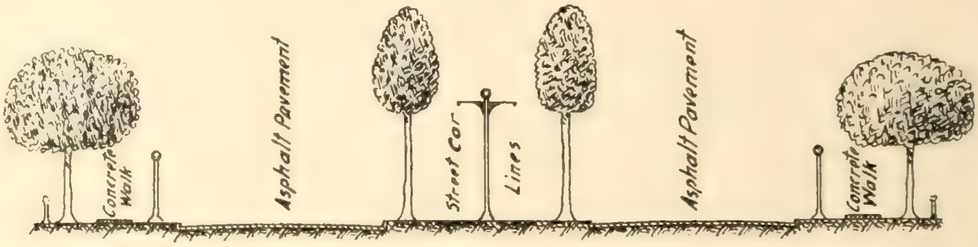
a machine. The interesting feature of this machine is the fact that there is but one power unit and that all the motions of the dipper and dipper handle are controlled by a drum which is operated by a rope drive giving it a thrust which is just as positive and powerful as if actuated by an independent unit. The simplicity of this design is obvious in that there are no engines, gears, belts or shafting on the boom to get out of order. This machine has made a remarkable record for itself and will undoubtedly be a factor during this present year.

A more recent development and one even more striking and epoch-making is the same machine driven by a Diesel type engine instead of a gasoline engine which can burn any type of oil that is sufficiently clean to pass through the pumps and will flow freely. The remarkable fuel economy of this machine is almost unbelieveable and we believe that this opens up a very important field, especially in those regions where ordinary fuel is expensive and difficult to obtain.

Another interesting development which has been forthcoming during 1922 is the successful application of caterpillar mounting for railroad type shovels. The rapidity with which these installations have been made all over the country is ample proof of the demand that will develop for this new device.

150 Ft. Boulevard Across Montreal Island

At a recent meeting of the members of the Metropolitan Commission of Montreal, it was announced that the Commission is to send a delegation to Quebec with authorization to ask the Legislature to include in the Commission's act of incorporation, a clause by which it would be empowered to extend the proposed Sherbrooke Street boulevard entirely across the Island from Ste. Anne de Bellevue in the west to Bout de l'Ile in the east. The accompanying illustration shows a cross-section of the proposed boulevard which would be 30 miles long by 150 ft. in width.



A cross-section of the proposed boulevard on Montreal island

It is figured that the increase in traffic of all kinds resulting from the proposed artery would be considerable benefit to merchants, manufacturers, hotels, etc., while its cost to property owners if distributed all over the Island, would be comparatively small It is estimated for instance, that the annual assessment will be about $3.00 on a $10,000 property, and less than 50 cents on an ordinary workman's house, these figures including sinking fund.

The members of the Commission will strongly urge those interested to go forward with the work of the proposed boulevard as early as possible on account of the rather low value of properties prevailing at present, obtaining thereby favorable expropriation terms. It is estimated that the approximate cost of the proposed road would be $60,000 per mile. Mr. J. A. A. Brodeur, of Montreal, is the president of the Commission.

Dominion Bridge Co.'s Annual Report

While showing a shrinkage in profits, the annual report of the Dominion Bridge Company, Ltd., for the twelve months ended Oct. 31, 1922, shows the company to have maintained its strong liquid position which keeps the company in a good position to meet continued adverse conditions or to enable it to profit by a return to more normal business conditions.

Profits from contracts, interest and dividends received on investments and miscellanous earnings, after allowing for directors' fees and reserve for doubtful accounts, amounted to only $188,670, as compared with $513,000 in 1921 and $1,092,123 in 1920. After allowance of $134,008 for depreciation, net earnings are left at $54,661, as compared with $378,693 for 1921 and $964,530 in 1920. The distribution of dividends on a four per cent basis, amounting to $260,000,, created a deficit of $205,339, as compared with a debit balance of $141,307 in 1921, after payment of dividends on the eight per cent basis and a credit balance of $444,530 in 1920. In 1921 the sum of $480,000 was alloted to the depreciation reserve, which left a profit and loss balance of $3,671,838 to be carried forward into 1922. The application of this balance to the deficit of the past year leaves at credit of profit and loss as of October 31, 1922, the substantial surplus of $3,466,500.

Obituary

Louis Zephirin Gauthier, well-known Montreal architect, died at his residence in Outremont a few days ago, in his eightieth year. Deceased was born in Sorel, P. Q., and first practised his profession in that town. In 1880 he took up residence in Montreal and has lived there since that time. Mr. Gauthier was at one time connected with Mr. L. F. Roy and later was senior member of the architectural firm of Gauthier and Daoust. He specialized in churches, hospitals and schools and several of the city's fine buildings were designed by him, including L'Ecole des Hautes Commerciales, Institute for the Deaf and Dumb on St. Lawrence Boulevard, church of St. Louis de France, Roy Street, St. Viateur church and many others.

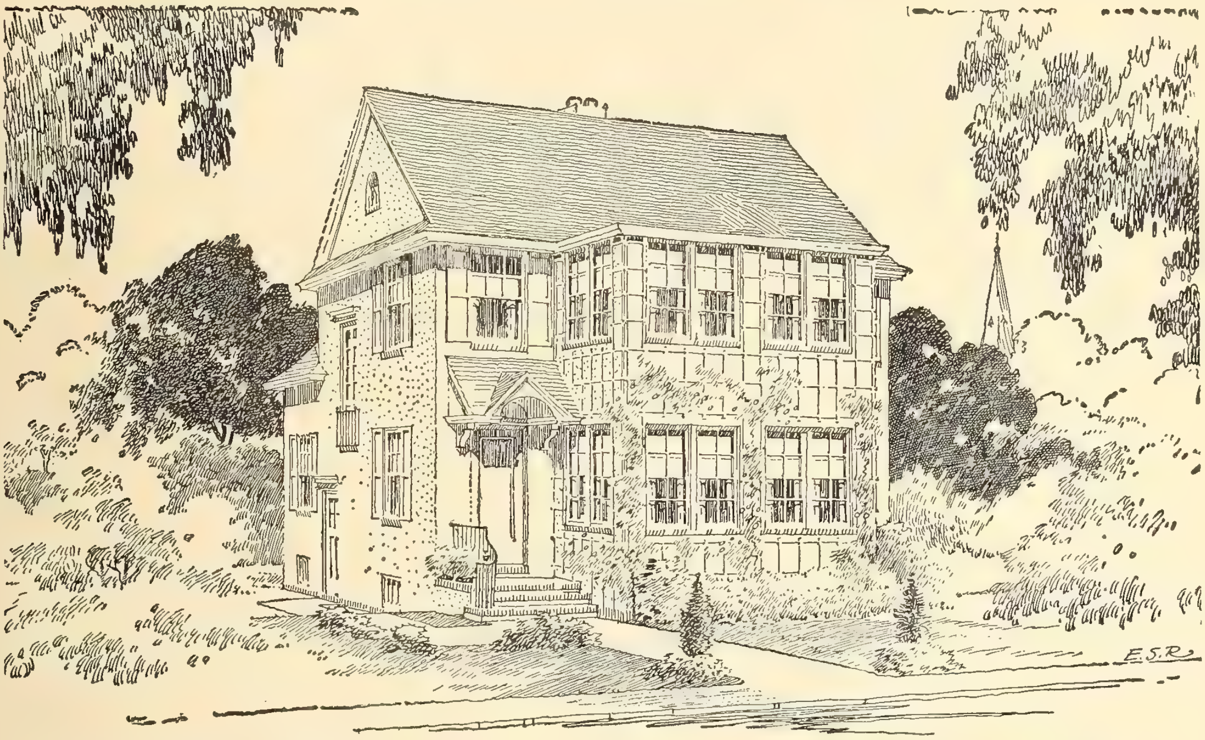
Trade Incorporations

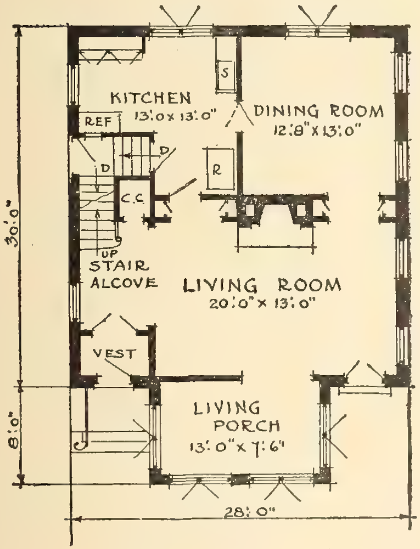
F. W. Scriven Construction Co. Ltd., with head office at Toronto, capital $50,000, to carry on a general contracting business.

Finn Construction, Moving & Wrecking Co. Ltd., with head office at Toronto, capital $40,000, to carry on business as contractors. builders, etc.

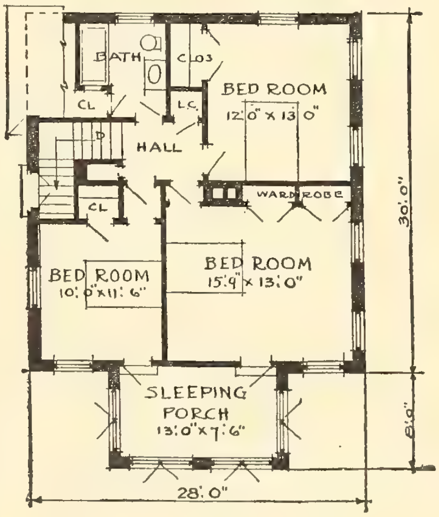
The Contract Record's

Weekly House Suggestion No. 51





FIRST FLOOR PLAN



SECOND FLOOR PLAN

This is a six-room, square, two-storey house which will make a home that is a model of compact and commodious planning. It is only 28 feet wide and could, if necessary, be nicely placed on a 35-foot lot, though a 40-foot lot would be better. It is designed for a western or southern frontage. The exterior construction is stucco on concrete walls, with concrete tile roof.

From a tile vestibule with double doors, one enters a convenient hallway and passes through an arch into a finely proportioned living room. An opening leads into a fine sun porch with casement windows on three sides. The dining room and kitchen occupy the rear of the house. Both rooms have windows on both sides.

The upstairs contains one small room and two large bedrooms; a sleeping porch above the sun porch is entered from the front bedrooms. The bath room has a tile floor.

The outside elevations are an adaptation of the Dutch colonial design. The effect of the white stucco on concrete block, with green blinds and trim and the red brick sills will be very pleasing. The Portland Cement Association is responsible for this house suggestion.

Mainly Constructional

East and West—From Coast to Coast

[illegible] & Company, lumber merchants of Casselman, Ont., recently extended their activities to include building contracting.

A new organization, known as the Asbestos Board of Trade, has been formed at Sherbrooke, P. Q., with the following list of officers: Hon. presidents, T. F. Manville, New York; Rev. L. N. Gastonguay, Asbestos, and J.R. Pearson, treasurer of the Canadian Johns Manville Co., Asbestos; president, J. H. Cote; vice-president, C. H. Shoemaker, manager of the Canadian Johns Manville Co., Asbestos; secretary, J.N. Gingras; treasurer, J.O. Bureau, manager of the Canadian Bank of Commerce Asbestos: Industrial Committee, P. H. Poudrier, G. E. Denault, U. J. Bruneau, E. C. Webb, Louis Lefebvre; local improvement committee, G. J. Boisvert, P. Chasse, Ant. Gauvin, Jos. Cote, C. Boisclair; advertising and printing committee, Art. Bolduc, G. J. Belanger, Wilfred Bruneau, Arthur Lockwood, Dr. Pelletier.

The Public Utilities Commission at London, Ont., is strongly advocating the installation of water meters in every city home, to prevent the huge daily wastage of water. About one-third of the city's residences are already equipped with water meters.

The official opening of the Banff-Windermere highway through the Canadian Rockies has been set for June 30, 1923, it was announced recently. On that date the last link in the great 6,500 mile scenic tour through western Canada and the United States will be thrown open to traffic, making the national parks of the two countries accessible for motorists from Mexico to western Canada. The opening ceremonies will take place at Vermillion Crossing, a point on the road midway between Banff, Alberta, and Windermere, B. C. The highway is 93 miles in length.

It was announced recently that the Back River Power Company has obtained from Quebec the power lease to build a dam across the Riviere des Prairies, beginning at St. Charles Street, just above the Sacred Heart convent in Ahuntsic ward. This dam will follow the shore line as far as Sault-au-Recollect church, and thence curve across to the head of Visitation Island, thence along the north shore of Visitation Island, and extending down the river to a distance of about 1,000 feet, where it turns at a right angle towards the north shore of the river. The total length of this dam will be about 11,000 feet. The power house will be situated on the north shore, where it is said about 45,000 h.p. will be developed.

The bursting of a giant coffer dam at Victoria, B. C., recently, will seriously interfere with construction work on the new Esquimalt dry dock. The side of the coffer dam, which was built to keep the sea out of the newly excavated dock basin, collapsed and great damage was caused by the water which burst through the barrier. It will be necessary to repair the coffer dam and pump out the water in the basin before work can be gone ahead with on the dry dock. The accident has thrown a great number of men out of work.

A big increase in building in York Township, Ont., has been evidenced by the 1922 totals. Some 4,066 buildings, of which 2,972 were homes, were built, at a value of $11,167,000. This is an increase of over $3,000,000 over the 1921 figures which were $8,101,000. The total for December was $372,000, as compared to $311,000 a year ago.

The Legislative Assembly of Quebec recently passed the David Bill providing for the founding of a museum of natural history in Quebec city, at a cost of $150,000. The bill also provides for a similar museum in Montreal, but this will not be gone ahead with until the required money is voted later on.

In the recent elections at Sandwich, Ont., the citizens voted for the joint filtration system scheme to serve the Border Cities, the votes cast being 575 for and 149 against.

The offices of the Nova Scotia Construction Co., at Halifax, were damaged by fire recently.

Port Arthur, Ont., has a huge elevator construction program for immediate development, involving $3,000,000 worth of building. The first item in this program will be a plant for the Bawlf Grain Company, of Winnipeg, for which a contract has already been let to the Barnett McQueen Company. This structure will cost $850,000 and will be erected on the south waterfront. This program will place Port Arthur in first place in elevator capacity.

It is stated that Canada's proposal for the appointment of an international railway board has been favorably received in the States. This board is desired to bring about the more speedy return of cars from American points.

A new company known as the Toronto Builders' Show Company will hold their first annual exhibition of builders' supplies in St. Lawrence Market on March 6, 7 and 8th next.

The ratepayers of North Vancouver, B. C., at the recent elections, approved of a by-law for the expenditure of approximately $50,000 on water works improvements. These works will comprise the improvement and extension of the Lynn Valley, East Seymour and Mosquito Creek waterworks systems.

It was announced a few days ago by F. L. Ferguson, Chief of the Drainage Division of Ontario, that a special two weeks' short course in Drainage Work will be held in Chatham commencing the fifth of February, which will be open to anybody in the county with special invitations to the operators of dredging and ditching machines. The course will probably be held in Harrison Hall and though the official opening will be on Monday, February 5th, the lecturers will not begin until the next day.

The Canadian Niagara Bridge Company will apply to the parliament of Canada, at its next session for an act extending the time for commencement and completion of the railway and general bridge across the Niagara River and the tracks on the said bridge and the lines of railway and other works which it was authorized to construct by Statutes of Canada, 1918, chapter 62, which bridge will be from some convenient point in the Province of Ontario between a point not less than two miles up-stream from Chippawa Creek and Fort Erie, in the County of Welland, to the opposite side of the Niagara River, in the State of New York.

A new building is to be erected by the T. Eaton Company, at Toronto, to replace the older portion of the store, now three stories high, facing on Yonge Street, with a frontage of 120 feet. The new building is to be eight stories in height and will join up with the new and northern section. The new building which is to be completed next fall, will be of fireproof, steel and concrete, will rise 115 ft. above the sidewalk, with a floor space of 200,000 square feet. It is to have two basements, the lower one to be 27 feet below the street level. Construction will commence at once. Sproatt and Rolph are the architects.

Personal

Mr. M. J. Rutledge was appointed town manager of Woodstock, N. B., recently, succeeding R. Fraser Armstrong, who is going to Toronto. Mr. Rutledge is well-known in Canadian engineering circles. The appointment is for a three-year term.

CONSTRUCTIONAL ACTIVITY

Period of Jan. 3 to Jan. 9, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Collin's Bay, Ont.
Kingston Suburban Road Commission will receive tenders until Jan. 22 for rock fill and concrete bridge. A. H. Muir, secretary.

Elma & Wallace Twps., Ont.
Listowel, Wallace and Elma councils will consider the construction of about 1½ miles of concrete pavement on the town line between Elma and Wallace Townships at cost of $75,000.

Fort Erie, Ont.
With the by-law passed, Town Council contemplates an extension to sewers costing $50,000.

Howick Twp., Ont.
Township Council contemplates drainage work to be undertaken in the spring. E. D. Bolton, Listowel, Ont., engineer.

Kincardine, Ont.
Kincardine ratepayers passed by-law on Jan. 1 authorizing purchase of $7,000 auxiliary waterworks pump.

Listowel, Ont.
Town Council contemplates the laying of a permanent pavement.

North York Twp., Ont.
$125,000 waterworks system contemplated by Township Council. By-law passed Jan. 1.

Sandwich, Ont.
Town Council is having plans prepared for $150,000 sewage disposal plant. Architects, McColl & Patterson, Gas Bldg. By-law passed authorizing contruction.

Victoria, B. C.
City is preparing plans for grading and paving to cost about $60,000.

York Twp., Ont.
Township Council contemplates extensions to watermains. Frank Barber & Associates Ltd., Jarvis St., Toronto, engineers. Tenders will be received until Jan. 13.

CONTRACTS AWARDED

Newport Centre, Que.
Dr. A. Richard has been awarded the general contract for $20,000 macadam road by the Town Council.

Railroads, Bridges and Wharves

Alma, N. B.
Provincial Government, Department of Public Works, will receive tenders until Jan. 10 for "Bonnet Lake" bridge. P. J. Veniot, Parliament Buildings, Fredericton, minister.

Brantford, Ont.
By-law for the construction of a bridge at a cost of $335,000 submitted on Jan. 1 carried. F. Adams, engineer.

Esquimalt, B. C.
Time for receiving tenders on drydock machinery is further extended. Tenders will be received until Feb. 15, 1923. R. C. Desrochers, Department of Public Works, Ottawa, secretary.

Fanny, B. C.
Dominion Government, Department of Public Works, Ottawa, want tenders on a wharf at Fanny Bay.

Newport, Que.
Town Council contemplates a steel bridge. Clerk, M. J. Smith, Newport Centre.

St. Basil, N. B.
P. J. Veniot, Minister of Public Works, Fredericton, will receive tenders for "Boniface" bridge until Jan. 10.

CONTRACTS AWARDED

Magog, Que.
Cote & Cote, Johnville, Que., have the general contract for a reinforced concrete bridge costing $35,985. I. E. Vallee, Parliament Buildings, Quebec, engineer.

St. Omer, Que.
Dominion Government Department of Public Works has awarded Thos. P. Charleson, Ottawa, the general contract for the reconstruction of St. Omer wharf at cost of $5,962.

Public Buildings, Churches and Schools

Bayfield, Ont.
Ottawa is being petitioned for a new Post Office. R. C. Desrochers, Parliament Buildings, Ottawa, secretary.

Birchcliffe, Ont.
Painting, heating, plastering, plumbing and electrical contracts for $20,000 Memorial Hall, not yet let. Owners, Scarboro Township Veterans' Association.

Brantford, Ont.
On Jan. 1 ratepayers passed a by-law authorizing the construction of a new school at cost of $45,000. A. K. Bunnell, secretary; F. C. Bodley, architect.

On Jan. 1 ratepayers authorized the expenditure of $81,000 for an addition to Collegiate Institute. F. C. Bodley, architect; A. K. Bunnell, secretary.

Ennismore, Ont.
Rev. J. V. McAuley, Parish priest, is receiving tenders until Jan. 15 for Ennismore's $60 000 church.

Fairville, N. B.
. $15,000 Fire Hall contemplated. Architect J. L. Feeney, St. John, N. B. Fire engine and equipment will also be purchased.

Galt, Ont.
On Jan. 1 ratepayers defeated a by-law for an addition to the Agricultural Hall.

Grey Twp., Ont.
Trustees of S.S. No. 10, secretary Harry Speirman, R.R. No. 3 Brussels, contemplate a school.

Hamilton, Ont.
Hamilton Board of Education contemplates a new school on Murray St. Jno. Poag, Lister Building, chairman of Building Committee. R. H. Foster, secretary-treasurer.

Alterations to Cannon St. school will include the installation of new lavatories. Secretary, R. H. Forster.

Alterations may be made to the Children's Shelter at cost of $20,000. J. P. MacKay, Dunsmore St., interested.

K. Connor, Larmoreux St. has the general contract for the alterations to Hamilton Post Office, costing $6,200.

By-law authorizing the construction of $90,000 Market Hall defeated.

Work will go ahead this year on extension to hospital. By-law passed on Jan. 1.

Hearst, Ont.
Van Rassell Bros., Cochrane, Ont., have the general contract for a jail at Hearst.

Meaford, Ont.
By-law for $75,000 Public School defeated. Secretary of School Board, A. G. Bright.

Midland, Ont.
Ratepayers passed by-law authorizing an expenditure of $30,000 on alteraions to high school. Sec-treas., C. A. Wilson; Wilfred Smith, engineer.

Montreal, Que.
Tenders will be called for about the end of January for an addition to "Rosemount" school. Bldg. Inspector, Mr Palmer.

Mount Hamilton, Ont.
J. Chappell, 32 Sixth St., has the carpentry contract for Wellington St., School.

Ottawa, Ont.
Tenders will be received until Jan. 10 by N. H. Lett, city clerk, for proposed hospital to cost $2,500,000. Associate architects, Stevens & Lee, Toronto, and J. A. Ewart, Ottawa.

Ratepayers defeated by-law for proposed Civic Abattoir to cost $75,000.

Paris, Ont.
Ratepayers passed by-law for $75,000 High School. Architect not yet appointed. Sec. Dr. W. J. Logie.

Pickering, Ont.
S.S. No. 4 West Pickering contemplates an extension to the school. Ar-

chitect not yet appointed. Sec.-treas. Mr. Baker.

Port Credit, Ont.
Walls are going in for $33,000 school. Contracts for roofing, plumbing, and heating, to be let shortly. Architects, Ellis, Ellis & Richardson, Manning Chambers, Toronto.

Preston, Ont.
Town Council contemplates a grandstand costing $8,000. By-law passed on Jan. 1. Reeve, E. B. Resist.

St. Eloi, Que.
Church costing $60,000 contemplated. Rev. L. C. H. Trembly, curate. P. Levesque, 115 St. John St., Quebec, architect.

St. Stanistas, Que.
La Societe D'Agriculture contemplates a $6,000 exhibition building. Sec. J. T. Jacob; no materials purchased.

Scarboro Twp., Ont.
Township Council contemplates a fire hall. Ratepayers passed by-law on Jan. 1. E. M. Crooker, Blantyre Ave., Toronto, reeve.

Strathroy, Ont.
By-law authorizing a $25,000 addition to hospital will be voted on this month. W. G. Murray, architect.

Thorndale, Ont.
Township Council will submit by-law to ratepayers authorizing the expenditure of $42,000 for a school near Thorndale, Ont. G. B. Vining, Thorndale, reeve.

Toronto, Ont.
St. Olave's Anglican Church, Swansea, contemplate a new edifice at the corner of Windermere and Ostend Aves. Harry Race, 120 Windermere Ave., member of building committee.

Work will commence shortly on $60,000 church and Sunday school for Gerrard St., Methodist Church. Bldg. Committee, J. G. Gale, 107 McGill St., Toronto.

Tenders will be called about Feb. 1 for St. Saviour's Parish Hall. Mr. Cecil, c/o St. Saviour's Parish, Swanwick Ave., chairman of building committee.

W. W. Pearse, sec-treas. Board of Education, Toronto, has called for tenders for all trades for 9 roomed school.

Welland, Ont.
Ratepayers have passed by-law authorizing the building of a market hall at cost of $30,000. Architect, N. A. Kearns. Clerk, W. E. Forester.

CONTRACTS AWARDED

Blairmore, Alta.
Watson & Abercrombie, Calgary, Alta., have the general contract for a barracks at cost of $29,740.

Brantford, Ont.
Turnbull & Cutcliffe, Colborne St., have the roofing contract for a school in Brantford. Richard Chave has contracts for painting and glazing. Board will buy school furniture.

J. A. Usher, Arthur St., has the electrical contract; Valley City Seating Co., furnishing contract; Brant Glass Co., glazing contract, for Baptist Church costing $20,000.

Drumheller, Alta.
Foote & Allyn, Edmonton, Alta., have the general contract for a barracks. Cost is $28,735.

Levis, Que.
L. A. Bussiere, St. Sebastien, Que., has the contract for 30,000 ft. of St. Sebastien granite and T. St. Laurent the contract for 5,000 ft of St. David granite for the wing being added to Levis college. Contracts total $25,000.

Electrical, plumbing and heating contracts for $45,000 car barns at Levis awarded to Brousseau & Freres, St. Paul St., Quebec. Gloves Ltd. c/o architect has the roofing contract.

Quebec, Que.
Contracts for $125,000 rectory being built by the Redemptorist Fathers awarded as follows: Carpentry, C. A. Veniza; steel, Eastern Canada Steel & Iron Works Ltd.; floors, J. A. Bernard; electrical, plumbing & heating, Jobin & Paquet; roofing, E. Falardeau; painting, B. Leonard.

Windsor, Ont.
Contracts for school in Windsor have been let as follows: Steel, Canadian Bridge Co., Walkerville; electrical, G. S. Whelpton, Windsor; tile, National Fireproofing Co., of Canada.

Business Buildings and Industrial Plants

Brampton, Ont.
McIlroy Belting & Hose Co., Hammond, Ind., contemplate building a $20,000 factory. Ratepayers passed by-law on Jan. 10 authorizing a $20,000 loan and a fixed assessment.

An addition to J. W. Hewitson Shoe Factory probable. By-law passed on Jan. 1 authorizing a fixed assessment for 10 years.

Chicoutimi, Que.
$35,000 loss when Ferdinand Fortin's store was destroyed by fire.

Coteau Station, Que.
Foundations in for $5,000 factory for Geo. Asselin, sash and door manufacturer. Prices wanted on lumber machinery for building and operating factory.

Glace Bay, N. S.
The Orange Society contemplates the rebuilding of a business block on Commercial St.

Goderich, Ont.
Goderich Elevator and Transit Co., contemplate an annex to grain elevator costing $250,000. By-law granting a fixed assessment passed.

Hamilton, Ont.
By-law for 5 storey office bldg. costing $300,000 defeated by ratepayers.

Warren & McDonnell, Home Bank Bldg., will call for tenders on a $30,000 printing plant in about 3 weeks.

London, Ont.
L. G. Bridgeman, Bank of Commerce Bldg., is preparing plans for an addition to J. A. Nash's jewellery store. Cost will be about $15,000.

Moncton, N. B.
C. T. White Co., Sussex, N. B., contemplate a lumber mill.

Montreal, Que.
Tenders are being received by Jas. MacDuff for altering a residence into stores and apartments. J. A. S. Houle, Dorion St., architect.

Tenders will be called for about the end of February for an Auto Show Window for J. Courville, Beaubin St. P. L. W. Dupre, St. James St., architect.

Newport Centre, Que.
M. Smith & Cie, will commence work on a $25,000 cannery about Mar. 1. Prices wanted on materials.

Ottawa, Ont.
Jones Motor Sales contemplate a new garage and showroom. President is Howard Jones.

Quebec, Que.
Pollack's Retail Store at 86 St. Joseph St., damaged by fire to the extent of $3,500.

Tenders are wanted by Tanguay & Chenevert, 20 D'Aiguillon St., for altering a warehouse into stores and offices.

St. John, N. B.
Estate of Wm. McLauchlin is repairing ovens and building recently damaged by fire.

Summerland, B. C.
Plans are being prepared for a $40,000 box factory for Summerland Lumber Co., Mineola, B. C.

Sussex, N. B.
W. S. Fairweather has had plans drawn for a store. Work will start in the spring.

Toronto, Ont.
H. A. J. Aldington, 53 Yonge St. Arcade, is receiving the contract for reinforcing in connection with the addition to the factory of the K. & S. Tire & Rubber Goods, Ltd., Toronto. W. W. Petley & Co., Toronto, are the general contractors.

Tenders are being received on plumbing, painting, hot air heating and electrical work, for three stores by W. Pendleton, general contractor 615 Greenwood Ave., Toronto.

A. Poyntz, 790 St. Clair Ave. W., has decided to build on Bloor St. W., instead of St. Clair Ave. Tenders for 3 stores and 12 apartments will be called for by W. G. Hunt, architect, Confederation Life Bldg., early in the spring.

Vancouver, B. C.
J. N. Harvey, Ltd., plans to remodel his store at cost of $6,000. Architect not yet commissioned.

Whitby, Ont.
Ratepayers passed by-law authorizing construction of Canada Wire Fence Co., $25,000 factory. Col. J. A. Currie, Warren Rd., Toronto, interested. Architects not yet appointed.

Windsor, Ont.
Plans are being prepared for a business building costing $80,000. G. A. McElroy, Ouelette Ave., architects. Jones Syndicate, owners.

CONTRACTS AWARDED

Montreal, Que.
Millwork contract for 4 stores and 7 apartments costing $100,000 awarded to Jos. Gariepy, 550 Delanaudiere St.

Sault St. Marie, Ont.
Contracts for remodelling Soo Lum-

ber Co's. warehouse let as follows: steel, McLarty Bros.; roofing, Bailey McMaster, 208 Albert St. E.; owners will do painting.

Toronto, Ont.

T. Eaton Co. Ltd., have let the contract for steel for the 8 storey addition to their store to McGregor & McIntyre. Thompson Bros., have the masonry contract.

Ebsary Gypsum Co. Ltd., Toronto, have the roofing contract for a $60,000 office building in Toronto.

Contracts for Macdonald Mfg. Co. Ltd., $100,000 factory awarded as follows: Canada Metal Window & Steel Products Ltd., Toronto, steel sash; W. Weeks Toronto, painting & glazing; John Stewart, Toronto, Roofing.

Anglin, Norcross Ltd., have the contract for excavating and footings for Cocoa Cola bottling plant. Tenders for balance of work will be called for in March.

E. Corner has the excavating contract for Gabriel Mfg. Co's. factory. J. F. Brown, architect. Other trades will be let shortly.

B. F. Sturtevant Co., of Canada, have the heating & ventilating contract for the Dominion Silk Co's. new building.

John V. Gray Construction Co., Queen St. E., have the general contract for $30,000 addition to Harris Abattoir plant.

Robt. Jordon, Hazelton Ave., has the contract for plumbing & heating for Holden & Co's. Ltd., building on Adelaide St. Hobbs Mfg. Co. have the glazing contract.

Painting contract for Imperial Oil Service Station on Queen St. E., let to Bavington Bros., Dundas St., W.

Windsor, Ont.

The glazing contract for the $300,000 Banque Provinciale Du Canada has been let to A. F. Ramsay & Co., St. Paul St., Montreal.

Canadian Bridge Co., Walkerville, Ont., have the contract for steel in the new Plant being built by the Border Cities' Star.

Residences

Acton, Ont.

Tenders will be received until Jan. 20 for bricklaying, plumbing, heating, interior trim and wiring for a $4,500 house being built by S. Cordiner.

Arran Twp., Ont.

Geo. Barclay, Tara, Ont., will rebuild $4,500 residence destroyed by fire.

Grimsby, Ont.

A. R. Fisher & Sons will let all trades on 2 bungalows costing $4,000.

Hamilton, Ont.

Ellison & Jones, Connaught Ave., have commenced a $5,000 residence.

Hamilton Home Builders contemplate 10 residences of brick construction in addition to those previously reported.

R. J. Coleman, Grosvenor St., has commenced work on a $5,000 house.

Morley Shaver, Ancaster, Ont., is building a brick residence in St. Clair Blvd.

Work will start in the spring on 3 residences costing $8,000. Owner and builder, J. Chappel, East Sixth St.

Morley Shaver, Ancaster, Ont., contemplates a 2 storey residence in Hamilton.

Bull & Axford, 124 Edmont St., Hamilton, will commence work shortly on 3 residences.

Bethune & Dirks, Ottawa St., N., contemplate building 30 residences in the spring.

Work will start in the spring on 15 residences for Ellis & Atkinson, Main St., east.

F. A. Shafer, 250 East Ave., N., contemplates erecting residences in the spring.

J. J. MacKay, Home Bank Bldg., contemplates building a residence.

F. Paulin, Home Bank Bldg., contemplates a residence this spring.

W. Bell, owner and general contractor, will build a $5,000 residence.

Work has just started on 3 residences costing $9,000. Owners and general contractors, Steel Realty Co., King St. E.

H. F. Thombs, Kensington Ave. S., will commence work on 5 residences in the spring.

Hamilton Home Builders have the foundations in for 2 residences costing $8,000.

Percy Ellis, will commence work in the spring on 5 residences costing $20,000.

Wm. Inrig, Flatt Ave., contemplates 3 residences costing $15,000.

Kingsville, Ont.

Manley Miner, contemplates a $4,000 residence. Excavating will start as soon as possible.

London, Ont.

J. M. Totten, Brighton St., contemplates a $4,000 residence.

Plans are being prepared by W. G. Murray for a $15,000 residence for R. H. Dowler. Interested in prices of all materials.

Adam Palmer, Adelaide St., contemplates one or more $4,000 residences in the spring.

Montreal, Que.

Senneville Development Co., 371 Cote des Neiges Rd., contemplate several residences. Mr. Johnson, secretary.

Prince Rupert, B. C.

M. P. McCaffery, Fulton St., is building a residence at a cost of $5,500.

G. W. Nickerson, is building a $6,000 residence. Mitchell & Currie, architects.

Scotland, Ont.

A. Allen, contemplates rebuilding residence destroyed by fire. Loss $3,000.

Toronto, Ont.

E. Blackmore, St. Clair Ave., contemplates a $10,000 residence and garage.

F. & S. Lankin, are building residences costing $7,000.

Churchill & Morrell, Woodbine Ave., will start work shortly on two $6,000 residences.

Wm. Edmonds, Glenholme Ave., is building 3 residences costing $7,500 each.

Webb & Peart, Triller Ave., will shortly remodel residences at 1212-14-16 King St. W., into stores and apartments.

Walter Griffin, 117 McRoberts Ave., has had D. H. Burnham prepare plans for a pair of residences.

Alex. Groat, 61 Lawton Blvd., contemplates residences on the Chaplin estate in the spring.

Walter Woolley, 21 Delaware Ave., is negotiating for sites for several residences.

D. H. Burnham, Lauder Ave., has prepared plans for Walter Griffin for two residences. No materials purchased.

C. A. Drew, 119 Nairn Ave., is excavating for a residence. Plans drawn by D. H. Burnham, 260 Lauder Ave.

Alex. Groat, 61 Lawton Ave., is having plans prepared for two bungalows.

A Hussey, 120 Greenlaw Ave., contemplates 2 residences in the spring.

Tenders are being received by Jas. Gordon, general contractor, on heating, wiring and plumbing for a pair of duplex residences costing $15,000.

Jas. Gordon, 885 Broadview Ave., is receiving tenders for wiring, heating and plumbing on a duplex residence.

Alex. Hussey, Ravina Cres., contemplates a pair of two storey brick residences.

Painting, plumbing, heating, electrical and plastering contracts for pair of residences costing $9,000 not yet let. Owner O. R. Bury, 34 Ashburnham Ave.

Foundations are going in for a pair of $7,000 residences for S. Allen, Woodycrest Ave.

D. C. MacKay, will erect a pair of residences at a cost of $7,000.

Two houses costing $5,000 each will be built by G. W. Cain, Kingswood Rd.

Caster & Kaake, Queen St. E., contemplate several residences.

J. H. Cairns, 561 Pape Ave., will build a pair of residences costing $7,000.

S. Janes, 722 Gladstone Ave., contemplates 2 residences.

Several residences are contemplated by W. E. Maybee & J. Fulger, 186 Sellers Ave., work will start in the spring.

Beal & Thompson, 124 Hatherly St., contemplate several residences in the Silverthorne district.

Chas. Bauckham, High Pk. Blvd., contemplates a residence. Work to start in the spring. D. H. Burnham, architect.

R. Nancarrow, Gilbert Ave., contemplates several residences in the Silverthorne district.

J. Fulger, Sellers Ave., contemplates 2 residences Earlscourt.

Plans are being prepared for Fife & Rowan, Runnymede Rd., for 3 residences with garages costing about $10,000 each.

Geo. Slightham, Coleman Ave., contemplates the erection of 10 residences.

CONTRACTS AWARDED

Montreal West, Que.

Jos. Gariepy, Delanaudiere St., has the millwork contract for a $9,000 residence.

Ottawa. Ont.

J. A. Ellacott, Bank St., has the electrical contract and P. Beaupre, Heney St. the plastering contract for $6,000 residence of H. Booth.

Outremont, Que.

Contracts for $30,000 residences be-

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

Tenders for the Construction of the Weston Vocational School, Weston, Ontario

General tenders only will be acceptable, and must be on special forms and in sealed envelopes, which will be furnished for this purpose by the Architects.

A deposit of a marked cheque of 2½% of the amount of the contract or a Bid Bond is required with each tender, and when the contract is executed a bond of 50% of the contract will be required.

The building is to be completed by September Jan. 9, 1923.

Tenders must be in the hands of the Architects on February 7th, 1923.

A deposit of $25.00, is required by the Architects to procure plans. In the event of the plans not being returned on the date agreed, the said deposit will be forfeited.

Plans, specifications, Tender Forms and information, may be had at the office of the Architects.

S. B. COON & SON,
4 St. Thomas Street,
Toronto.
2
Jan. 9, 1923.

Toronto Transportation Commission

TENDERS

Sealed tenders will be received for the supply and erection of the following boiler house equipment for the proposed General Repair Shops, Bathurst Street and Davenport Road, Toronto:

(A) Horizontal Return Tubular Boilers.
(B) Boiler Settings.
(C) Underfeed Stokers.
(D) Draft Fans.
(E) Boiler Feed Pumps.

Tenders will be received for the equipment under each heading separately, and must include all of the work contemplated under each heading.

All tenders to be endorsed "TENDER FOR BOILER HOUSE EQUIPMENT, GENERAL REPAIR SHOPS" and to be addressed to the Chairman of Toronto Transportation Commission, and must be delivered to the Offices of the Commission, 5th Floor, Public Utilities Building, Front and Yonge Sts., not later than noon **January 17th, 1923**.

Each tender must be on the Commission's form of tender, and must be accompanied by an accepted Bank Cheque, payable to the Toronto Transportation Commission, for two and one-half per cent (2½%) of the amount of the tender.

Plans and specifications, Form of Tender and instructions to bidders may be had on application to the Commission, Buildings Department, 3rd Floor, Public Utilities Building, Toronto, immediately.

The lowest or any tender not necessarily accepted.

TORONTO TRANSPORTATION COMMISSION
H. H. COUZENS,
General Manager,
Toronto Transportation Commission.

RATES

20 cents per agate line (14 lines to the inch) Positions Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

Notice to Contractors

Separate sealed tenders marked "Tender for Contract No..........." will be received by the undersigned until 12 o'clock noon on **Monday, February 12th, 1923**, for the following work on the Provincial Highways:

Concrete Pavement

Contract No. 794 Brantford to Paris 5.6 miles.
" " 795 Woodstock to Ingersoll 7.1 miles.
" " 796 Binkley's Hollow 0.3 miles.
" " 860 Dundas Mountain 0.6 miles.

Asphaltic Concrete Pavement

Contract No. 797 Dundas St. from Clappisons Corners to Road between Lots 15 and 16, Nelson Twp. 6 miles.
Contract No. 921 Dundas St. from Road between Lots 15 and 16 Nelson Twp. to 16 Mile Creek Bridge 7.2 miles.
Contract No. 863 Dundas Street from end of Pavement west of Cooksville to West Limit of Toronto Twp. 5.5 miles.
Contract No. 948 Dundas Street from West limits of Toronto Twp. to 16 mile Creek Bridge 4.6 miles.
Contract No. 864 Bloor Street from Danforth Turn easterly and along Kingston Road to end of concrete pavement 2.8 miles
Contract No. 897 Pickering to Whitby 5.1 miles.
Contract No. 918 Kingston Road from G.T.R. Crossing to East Limits of York County 4.4 miles.
Contract No. 798 Ottawa - Prescott from Merivale side road North 3.2 miles.

Bituminous Penetration Pavement

Contract No. 908 Black's Corners to Freelton 5.7 miles.

Macdam Roadway

Contract No. 799 From 3 miles North of Belleville northerly 1¼ miles

Macadam Base Course

Contract No. 800 L'Original West 5.0 miles.
Contract No. 801 East Limit of Cornwall easterly 3.1 miles.
Contract No. 804 Perth South to Scotch Line includes grading 1.56 miles.

Grading

Contract No. 802 Whitby Lindsay Road 5 miles.
" " 803 Wendover easterly 4.0 miles
" " 805 Joyceville South 2.6 miles.
" " 806 South Limit of Innisfil Twp. Northerly 4.0 miles.
" " 807 Caledon Mill to Melville Hill 5.3 miles.
" " 808 Mardon North 4.0 miles.
" " 809 Rockwood West 3.1 miles.
" " 810 Acton to Georgetown 4.0 miles.
" " 811 Leamington to Ruthven 3.0 miles.
" " 812 Ruthven towards Essex 6.0 miles.
" " 813 Maidstone East 4.0 miles.
" " 814 Ruscom East and Comber east 2.8 miles.
" " 815 West limit of Mosa Easterly including Wardsville diversion 6.0 miles.

Surface Treatment of Macdam Roads with Tar

Contract No. 816 Napanee Easterly 5.7 miles
" " 817 Kingston westerly 8.0 miles.
" " 818 Kingston Easterly 15.0 miles.

Concrete Culverts

Contract No. 819 Crosby South Township.
" " 820 Drummond Township.
" " 821 Nepean (Base Line).
" " 822 Ross.
" " 823 Osnabruck.
" " 824 Lancaster.
" " 825 Sophiasburg.
" " 826 Sidney.

Plans and specifications, information to bidders, tender forms, and tender envelopes may be obtained on and after Wednesday, January 17th, 1923, at the office of the undersigned, or from the following Resident Engineers:

C. K. S. Macdonell, Woodstock,
C. H. Nelson, Whitby,
A. H. Parker, Cornwall.
H. A. Smail, Kingston.
C. A. Robbins, Durham.
A. L. Baldwin, Brockville.
R. S. Smith, Renfrew.
C. E. Bush, Orangeville.
D. H. Philp, Toronto.
W. M. Webb, Kingsville.
W. F. Noonan, Napanee.
A. Earchman, Carleton Place.
H. E. MacPherson, Barrie.
J. Sears, Chatham.
F. Brinkman, L'Original.
H. C. Rose, Guelph.
G. G. Greig, Waterdown.

A marked cheque for $1,000.00 payable to the Minister of Public Works and Highways, Ontario, or a Guaranty Company's bid bond for a similar amount must be attached to tenders for pavements, roadways, base course, and bridge construction, and on all other tenders the above conditions apply, but the amount of bond or cheque required is $500.00. A Guaranty Company's Contract Bond for 50 per cent. of the amount of the tender will be furnished by contractor when contract is signed. All bonds must be made out on Departmental forms.

The lowest or any tender not necessarily accepted.

W. A. McLEAN
Deputy Minister of Highways.
Department of Public Highways, Ontario,
Toronto, January 10th, 1923. 2

Asphalt Plant Wanted

Wanted to purchase Asphalt Plant in good working condition. Box 84, Contract Record, Toronto. 2

To contractors or municipalities and executives: —Wanted—position as superintendent or foreman, by married man; 30 years' practical experience mining, mechanical and construction engineering, tunnel, roads and bridges, installing, moving and repairing machinery; have handled men and material in many parts of the world; A1 mechanic; willing to go anywhere or do anything. F. J. M. Blackham, 285 North Cumberland Street, Port Arthur, Ontario. 47-2

TOWNSHIP OF SCARBORO

Tenders for Equipment

Sealed tenders marked "Tenders for Snow Plows," will be received by the undersigned at his office, Bank of Commerce Bldg., Stop 19, Kingston Road, Toronto, up to 12 o'clock noon, **Monday, January 22nd, 1923**, for the supply of 2 road plows.

Bidders must supply specifications of the plows tendered on. All bids must be accompanied by a marked cheque for 5% of the tendered price.

The lowest or any tender will not necessarily be accepted.

C. E. FRASER,
Township Engineer.
2

Notice to Contractors

Kingston Suburban Roads Commission

DEVIATION OF THE BATH ROAD COLLINS BAY PROPOSED CAUSEWAY

Competitive bids wanted for:—
(1) Rock Fill.
(2) Concrete Bridge and Rock Fill.

Sealed Tenders, addressed to A. H. Muir, Secretary to the Kingston Suburban Roads Commission, City Hall, Kingston and marked "Tenders for Causeway" will be received up to **5 o'clock P.M., the 22nd day of January, 1923**, for the construction of a Causeway.

Plans, specifications and form of tender may be seen at the office of the undersigned.

The Commission does not bind itself to accept the lowest or any tender.

A. M. RANKIN,
Chairman of the Commission.
R. H. FAIR,
County Road Superintendent.
Kingston, 30th. Dec. 1922. 1-2

WE WILL BOND YOU

Credit Speaks

Customers like to do business with contractors in good standing. Our Guaranty Bonds assure this.

Resources over - $31,790,000
Canadian Securities - $ 2,247,500

HEAD OFFICE
36 Toronto Street
TORONTO

Arthur E. Kirkpatrick
General Manager for Canada

BRANCH OFFICES
Paris Building
WINNIPEG

Sidney W. Band
Assistant General Manager

112 St James St.
MONTREAL

W. R. Kirkpatrick
Canadian Secretary

UNITED STATES FIDELITY & GUARANTY
COMPANY

STEEL PILING

1,000 tons 40 ft. long
14" x 3/8" and 7" x 1/4"
Already to Load
UNIVERSAL EQUIPMENT CO.,
Niagara Falls.
1-T.f.

ing built by T. Gray, 974 Tupper St. awarded as follows: roofing, Dominion Sheet Metal, Laval Ave.; electrical, G. Shearington, Park Ave. extn.; plumbing and heating, Beattie Bros., City Councillors St.; plastering, A. Leonard, c/o general contractor.

St. Catharines, Ont.
Newman Bros., 75 St. Paul St., have let the following contracts on a $6,000 duplex: roofing, H. H. Wilson, Niagara St.; electrial, H. C. Holmes, Ann St.; plumbing and heating, S. P. Gourly, King St.; painting, Leach and Jones, James St.

Toronto, Ont.
Geo. Hubbert, 195 Jarvis St. has the painting contract for a $12,000 residence on the Lake Shore Rd.

R. Brownlee, 17 Edgewood Cres., has awarded the following contracts on his $6,000 house: Drains, H. Innis, Sherwood Ave.; electrical, R. Chalk, Greensides Ave.; plumbing, and heating, Geo. Purdee, Yonge St.; painting, J. Weir, Greensides Ave.

Contracts for S. Haick's $6,000 residence let as follows: heating, Harry Sellers; plastering, McKenzie; electrical, G. Armstrong; plumbing, Shearer & Russel; painting, Tom Lane.

Duffort Bros., Kingston Rd., have the contract for plumbing and heating for $5,000 residence. M. Kaplan has the electrical contract.

Power Plants Electricity and Telephones

Fort Erie, Ont.
Town Council contemplates an extension to lighting plant at cost of $10,000. A. E. Seaton, Town Clerk.

Fires

Moncton, N.B.
Mrs. James McFarlane will rebuild a store destroyed by fire.

New Waterford, N.S.
Store and residence of Peter Coady, 14 Waterford St., destroyed at loss of $7,000.

St. Alphnose, Que.
Hotel owned by Alexandre Boucher, Lotbiniere, Que., destroyed at loss of $20,000.

St. Charles, Ont.
$15,000 loss suffered by United Farmer's Co-operative Co. when fire destroyed their store.

Sault Ste. Marie, Ont.
Store owned by Sam Travaglini gutted by fire. Loss is $3,000. Owner will rebuild in the spring.

P. Larmon will rebuild $7,000 store destroyed by fire. Building will be of brick construction.

Jas. Aiello's store destroyed. Loss estimated at $6,000. Owner will rebuild in spring.

Seaforth, Ont.
Wm. Kerslake's flour and feed store gutted. Loss is $5,000. Owner is undecided about rebuilding.

Sturgeon Falls, Ont.
Business Block owned by Fortier & Beauchesne destroyed by fire. Loss about $175,000.

Twelve O'clock Point, Ont.
Harry Groff, Trenton, proprietor of summer hotel destroyed by fire. Is undecided about rebuilding. Loss $6,000.

Walsingham Twp., Ont.
Buildings of Jno. Zimmer completely destroyed by fire. Loss about $3,000. Will probably rebuild in the spring.

Miscellaneous

Ottawa, Ont.
Ratepayers on Jan. 1 defeated by-law for playground, equipment, etc.

Sturgeon Falls, Ont.
Sturgeon Falls Arena Co. will commence work next summer on a $15,000 rink.

Toronto, Ont.
F. W. Scriven & Co., a newly incorporated company of general contractors, have their offices at 704 Excelsior Life Bldg., Toronto.

Windsor, Ont.
St. Dennis Hardware Co. wants prices and information on metallic ceilings.

MacLean Reports Cover Canada

MacLean Building Reports will give you accurate, advance information on every building and engineering contract of consequence in the Dominion.

These reports are issued daily and reach subscribers in ample time to bid on the work or submit prices for the machinery, equipment, materials or supplies required.

Subscriptions may be placed for any one city, portion of a Province or more than one Province. Rates range from $25 yearly for the smallest cities to $500 yearly for the entire Dominion.

Hundreds of firms are deriving much financial benefit from the use of MacLean Building Reports. Tell us what territory you cover and put it up to us to show how we can help you get more business.

Try this service out. The result will please you. Write today for rates and free sample reports.

MacLEAN BUILDING REPORTS Ltd.

345 Adelaide St. W. - - TORONTO
119 Board of Trade Building - MONTREAL
325 Main St. - - - WINNIPEG
106 Winch Bldg. - - VANCOUVER

Sturtevant

Cut Down Operating Costs

Provide a circulation of pure air through well heated buildings and you wipe out the big item of illness and decreased efficiency among employees.

Sturtevant sales-engineers can prove to you the economy of adequate ventilation and heating systems. Let them show you what they have done for other industrial plants; avail yourself, whatever your problem, of their varied experience.

Ask for folder 606

B. F. STURTEVANT CO.
of Canada, Ltd.
MONTREAL GALT TORONTO

Will Repair Station

The Dearborn street station which was partly destroyed by fire will be repaired and will be used again by all eight roads which have made it their terminal for years past, president H. G. Hetzler, of the Chicago and Western Indiana railroad, owners of the property, announced. The repair work will be started at once and in the meantime roads entering the station will use an annex to the main building as a passenger terminal.

Rebuilding Rheims

It is anticipated that within five years the city of Rheims will be entirely reconstructed after the destruction caused by the Germans during the war. This year 1,500 houses, which were fully or partially destroyed, have been rebuilt, and the construction of 600 new buildings is progressing. It is stated that the future progress of Rheims will depend, in a great measure, on the way in which Germany fulfills her obligations to France.

Factory Excavation

Construction is progressing rapidly on foundation works for the large new Ford factory south of the Grand Trunk Railway at Ford, Ontario. Six large steam shovels have been employed daily for more than two weeks, removing earth for concrete placements for heavy machinery, and for the walls of the building.

One hundred wagons and motor trucks are engaged in hauling the earth to a point on the new Ford Motor Company river frontage immediately west of the Walkerville Boat Club. It is estimated that thousands of loads will yet be required to complete the filling operations planned for new dock construction in the spring. Frost in the ground retarded the digging operations at the new factory site only one day since the work commenced. It is planned to continue actively with construction of the large new factory throughout the winter months.

Hydraulic Dredge for Foochow

The Min River Conservancy Board, Foochow, China, invites tenders for the delivery, c. i. f. Foochow, China, of a steam-operated, river-type, hydraulic dredge, in knocked-down condition, to be used in improving the channel of the Min River. The material to be dredged consists almost entirely of sand, varying from coarse (35 per cent being retained on a No. 20 sieve) at the upper end of the work to fine (5 per cent being retained on a No. 20 sieve) at the lower end. Capacity is to be 200 cubic yards of sand per hour, when discharging through a pipe line not more than 3,000 feet in length and to an elevation of not more than 20 feet above the water surface, and capable of dredging to a depth of 32 feet.

The boiler must be constructed in accordance with the specifications of the Boiler Code Committee of the American Society of Mechanical Engineers. All steel used in the hull must meet the requirements of the specifications for structural steel for ships of the American Society for Testing Materials.

Tenders must be submitted at Foochow not later than February 15, 1923.

·BULLETIN·No 5·

·BURLINGTON·STEEL·Co·LTD·

RAIL CARBON
REAL STRENGTH

·HAMILTON·ONT·

·AUTOMATIC · PROTECTION·

IF YOU DROP A PIECE OF TOOL STEEL ON THE FACTORY FLOOR IT WILL PROBABLY BREAK BUT THIS DOES NOT CONDEMN THE USE OF TOOL STEEL.

IF YOU BEND A RAIL-CARBON BAR WITH A JERK IT IS LIABLE TO BREAK, BUT NEITHER DOES THIS CONDEMN THE BAR.

THE ELASTIC LIMIT OF A MILD STEEL BAR IS AROUND 33,000 lbs. per sq. inch. THE ELASTIC LIMIT OF A RAIL-CARBON BAR IS WELL OVER 50,000 lbs. per sq. inch OR AN INCREASE OF 50%.

SOME ENGINEERS WILL TELL YOU THEY HAVE SEEN RAIL-CARBON BARS ACCIDENTLY DROPPED AND BROKEN IN TWO

DOMINION PARLIAMENT BUILDING OTTAWA
RAIL CARBON STEEL BARS USED FOR REINFORCING CONCRETE

DID YOU EVER CONSIDER WHAT WOULD HAPPEN TO A MILD STEEL BAR IF DROPPED UNDER SIMILAR CONDITIONS?

THE BLOW WHICH BREAKS THE RAIL-CARBON BAR WOULD STRESS THE MILD STEEL BAR AWAY BEYOND ITS ELASTIC LIMIT, THE METAL WOULD BE PERMANENTLY STRAINED BUT YOU DON'T KNOW IT AND YOUR INSPECTOR CAN'T FIND IT OUT.

BENDING IN THE FIELD IS MOST COMMONLY DONE BY UNSKILLED LABOR.

UNSKILLED LABOR RARELY REALIZES THAT ANY AND EVERY BAR MUST BE BENT AROUND THE MANDRIL SLOWLY IN ORDER TO ALLOW THE METAL TO "FLOW."

THE WORD YANK IS NOT DEFINED IN WEBSTER'S DICTIONARY BUT IT MIGHT VERY TRULY BE DEFINED AS "THE PREVAILING METHOD, EMPLOYED BY UNSKILLED LABOR IN BENDING REINFORCING BARS."

UNDER THE "YANK" METHOD, THE MILD STEEL BAR IS PERMANENTLY STRAINED AND IS SO EMBODIED IN THE STRUCTURE,— THE HOOK AT THE END OF YOUR RODS IS RENDERED USELESS.

UNDER THE "YANK" METHOD THE RAIL-CARBON BAR BREAKS AND IS THROWN OUT,- AND YOUR CONTRACTOR SOON SEES TO IT THAT THE "YANKING" STOPS.

WHICH DO YOU PREFER:
AUTOMATIC PROTECTION OR CONCEALED DEFECTS?

WE HAVE EVERY MODERN FACILITY AT OUR PLANT FOR BENDING TO YOUR SCHEDULE AND PREFER TO SHIP THE BARS TO YOU CUT TO LENGTH, TAGGED AND BENT READY TO DROP INTO THE FORMS.

WE PRIDE OURSELVES ON FAST AND ACCURATE DELIVERIES.

WHY NOT TRY US OUT?

·BULLETIN·No 6 - THE ·SPECIFICATION·

Current Prices of Building and Engineering Materials

CEMENT (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Retail lots including bags	per bbl.	$4.60	$4.40	$4.80	$3.70
Car lots, including bags	per bbl.	3.85	3.68	4.16	3.35
Refund on bags	each	.20	.20	.20	

LIME (Delivered on job):—					
Lump, in retail lots	per ton	14.30	14.00	.58 bu.	2.70 bbl
Lump, in car lots	per ton	12.70**	11.00	13.80 ton*	2.60 bbl
Hydrated, in retail lots	per ton	20.00	26.00	.60 bag*	30.00
Hydrated, in car lots	per ton	19.00	21.00	.54 bag*†	25.00

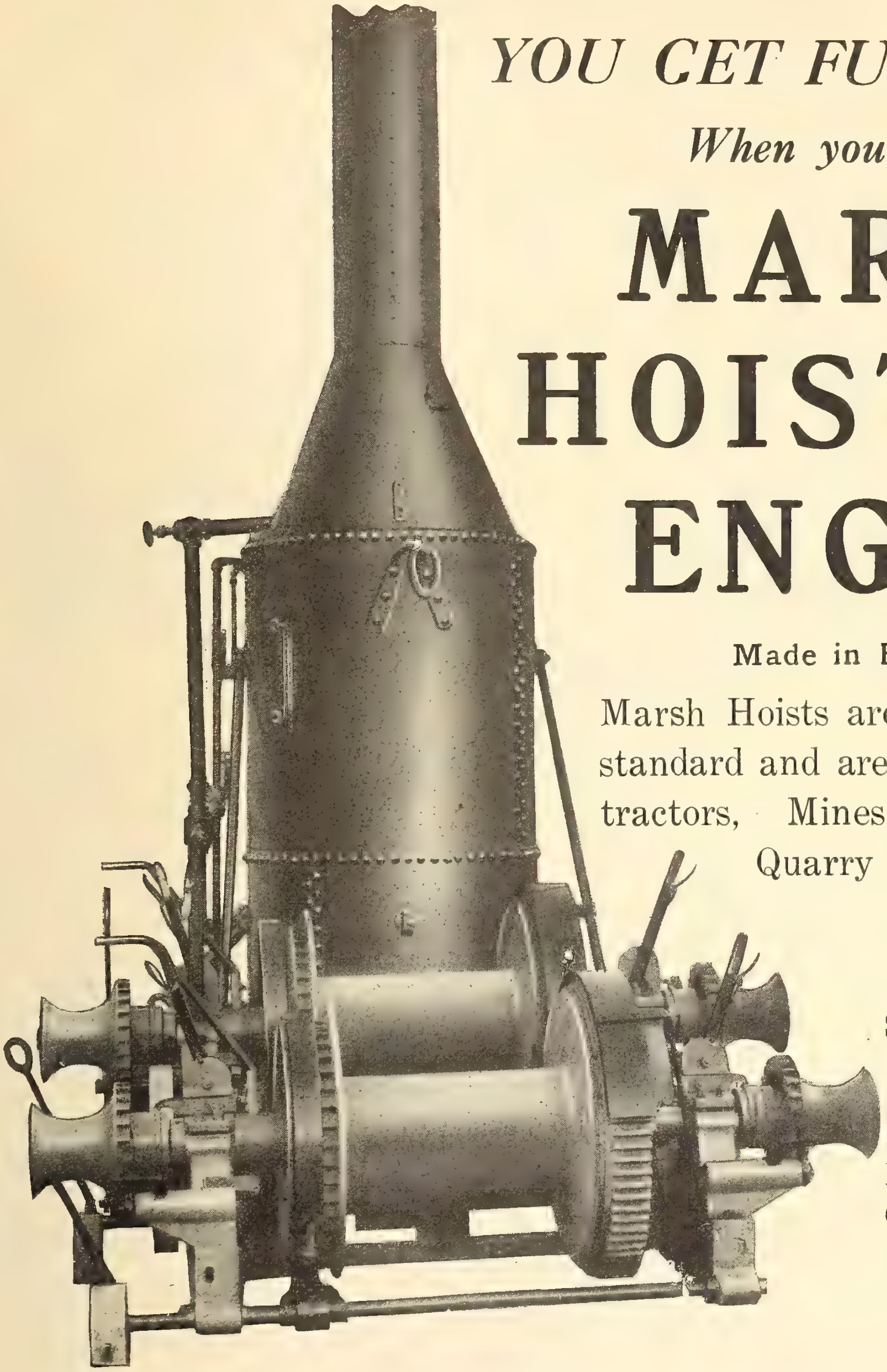
BRICK and TILE (Delivered on job):—					
Common face brick	per M.	24.00	16.00*	19.00	30.00
No. 1 dry pressed brick	per M.	31.00	30.00	36.00	70.00
No. 2 dry pressed brick	per M.	29.00	25.00	32.00	
Enamelled brick	per M.	125 up to	230.00	185.00	150.00
Wire cut brick, for foundation work	per M.	21.00	19.00		50.00
Sand lime brick	per M.	17.00		18.00	
Hollow building tile	per M.			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	60-95	60-75	85-100	80.00
Fire clay	per ton	13-20	15-16.00	35.00**	22.00

STONE, SAND and GRAVEL (f.o.b. cars on siding):—					
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.00 yd.
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 “	“ “
Crusher run	per ton	2.20½		3.00 “	“ “
Rubble stone	per ton	2.45	1.70	15.00 cord	“ “
Gravel, 2 in. screened	per ton	2.05		2.45 yd.	“ “
Gravel 1 in. screened	per ton	2.31	1.50	2.75 “	“ “
Sand, screened	per ton	1.42½	1.25	1.90 “	“ “
Pit run	per ton	1.52¾	1.25	1.90 “	“ “

STEEL and IRON (f.o.b. warehouse):—					
Mild steel bars, ¼ in. and heavier	per 100 lbs.	3.25 base	3.25 base	4.35	$4.00
Bands 3/16 in. and lighter	per 100 lbs.	3.75 “	3.25 “	4.85 base	
Hoops	per 100 lbs.	4.50 “	4.25 “		
Twisted and deformed bars	per 100 lbs.	3.35 “	3.25 “	4.20	4.00
Angles, channels and tees under 3 in.	per 100 lbs.	3.35 “	3.75 “	4.95	6.00
Structural shapes	per 100 lbs.	3.60 “	3.75 “	4.75	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.25 “	3.50 “	4.75	6.25
Plates—3/16 in.	per 100 lbs.	3.60 “	3.85 “	5.15	6.50
Plates—10 gauge	per 100 lbs.	4.15 “	4.00 “	5.45	6.50
Black sheets—28 gauge	per 100 lbs.	5.00 “	4.50 “	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.20 “	6.00 “	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	6.20 “	6.50 “	7.70	8.25-8.50
Rivets	per 100 lbs.	5.75 “	5.50 “	7.00 base	
Cast iron pipe	per ton	60.00	55.00		

VITRIFIED CLAY PRODUCTS (Delivered on job):—					
Sewer pipe, 4 in.	per ft.	.40	.30	.35	.28
Sewer pipe, 6 in	per ft.	.60	.45	.45	.48
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.55
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.70
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.85
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00	.90	.65	.75
Chimney tops	each	9.00	3.50–5.00	7.50	4.50–6.00
Discounts		45 % truck lots 50 % car lots	20 % 50 %	5 %	

CEMENT:—*Discount of 10 cts. per bbl. in 20 days. Price f.o.b. cars is $3.75 †Subject to 5% discount. **Excluding bags.
LIME:—*Discount of 5%. †Bag of 50 lbs. **Price f.o.b. cars is $11.70.
BRICK AND TILE—*f.o.b. plant.
STONE SAND AND GRAVEL:—*Winnipeg prices subject to 5% disco **Toronto prices include sales tax.



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When you buy a

MARSH HOISTING ENGINE

Made in Belleville, Ont.

Marsh Hoists are built up to a high standard and are favorites with contractors, Mines, Bridge Erectors, Quarry and Lumbermen.

Standard Hoists
in Stock.
Special Hoists
built to order.
— *also* —
Derrick Irons, Cars, Buckets, Skips, Mine Cages, etc.

Send for Catalogue

We have a complete assortment of Machinery and Supplies. Bucyrus Shovels, Western Cars, Vulcan Locomotives, Byers Cranes, Barber-Greene Bucket Loaders and Conveyors, Boilers, Pumps, Road Machinery, etc, etc.

MUSSENS LIMITED

Montreal Toronto **Winnipeg** Vancouver

CURRENT PRICES OF BUILDING AND ENGINEERING MATERIALS— continued

Lumber (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver*
Flooring, 1 x 3 and 4 in., clear, E. G. fir	per M.	100.00	60.00	84.00	55.00
Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	75.00	65.00	56.00	30.00
Flooring, No. 1 pine	per M.	70.00	80.00	64.80	
Flooring, No. 1 Spruce	per M.	45.00	40.00	39.60	
Flooring, birch and maple, 13/16 in. clear	per M.	130.00	110.00	152.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	130.00	125.00	140.00	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	75.00	60.00	56.00	30.00
V joint, No. 1 pine	per M.	70.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	43–58	45.00	63.75	
Pine, 2 x 4 to 12 in., common rough	per M.	50/55	70.00	36.00	
Hemlock, 2 x 4 to 12 in.	per M.	40-42.00	40.00	36.00	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	40–50.00	50.00	36.00	11.00-13.50
Spruce, 1 and 2 x 4 to 12 in.	per M.	41/46	45–35	36.00	
Timbers, fir, 10 x 10 in. and up	per M.	65.00	58.00	47.00 base	17.-22.00
Lath, No. 1 white pine	per M.	14.00	12.00	12.00	
Lath, M. R. spruce	per M.	10.00	8.50	10.00	7.00
Shingles, XXX B.C. cedar	per M.	6.35	5.00	5.25	3.40
XX B.C. cedar	per M.	5.00	4.25	3.75	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	108.00	55.00
Fir casing	per M.	1 ct. per in.	100.00	108.00	
PAINTS, OILS, COLOURS (delivered):—					
White lead ground in oil, less than ton lots	per cwt.	14.00	13.35	14.85	15.80
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	22.00
Putty in bulk	per cwt.	6.70	3.75	5.50	9.25
Steel sash putty in bulk	per cwt.	7.20	6.00	8.75	7.75
Boiled linseed oil, in bbls.	per gal.	1.15	1.04	1.13	1.28
Raw linseed oil, in bbls.	per gal.	1.18	1.02	1.10	1.25
Turpentine, in bbls.	per gal.	2.00	1.95	2.15	1.60
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 4/5	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 1/5	.45
PLASTER (Delivered):—					
Hard wall plaster, sanded	per ton	13.50	15.00	25.00	30.00
Plaster of paris, in bbl. lots	per bbl.	6.00	5.35	1.60 bag*	7.50
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu.	1.50
LABOR:—					
Bricklayers	per hr.	1.00	.80–.90	1.15	1.06¼
Structural Iron Workers	per hr.	.85	.50–.75	1.25	1.00
Plasterers	per hr.	1.00	.80	1.05	1.06¼
Hoisting Engineers	per hr.	.70–.80	.50	.90–1.10	1.00
Plumbers	per hr.	.90	.60–.75	1.00	.90
Carpenters	per hr.	.80	.65	.90	.81¼
Painters	per hr.	.75	.55–.65	.80	.81¼
Electrical Workers	per hr.	.80	.65	.70– .90	1.00
Roofers	per hr.	.65	.65		.90
Laborers	per hr.	.40–.50	.30	47½–.55	.50–.56¼
Sheet Metal Workers	per hr.	.75			.90

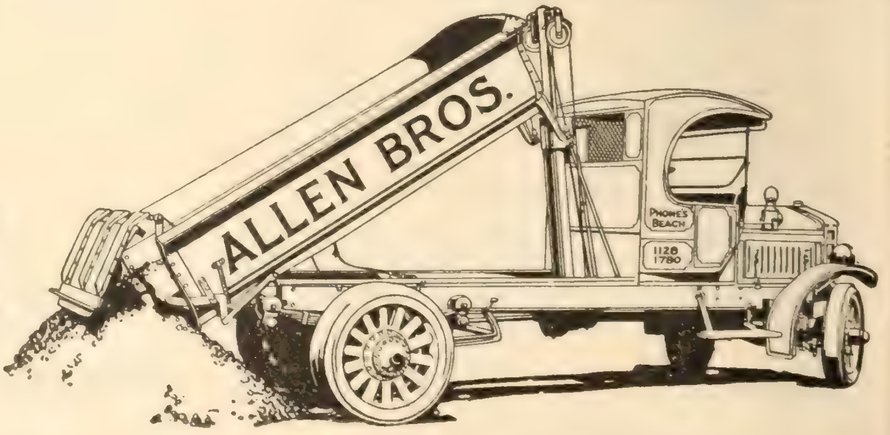
LUMBER:—*Owing to the general unstable condition of the present lumber market, Vancouver dealers refuse to quote any prices at all especially for Prairie or Eastern publication. The prices are, moreover, fluctuating from day to day. Such prices as we quote are, therefore, averages and not standard.

PLASTER *Including bags.

SCREEN GRAVEL
PEA GRAVEL
SAND

Rapid Truck Delivery. Just Phone
Beach 1128 or 1780

ALLEN BROTHERS
STOP 19, KINGSTON ROAD
TORONTO, ONT.



Wettlaufer Brick Presses and Mixers

—the recognized
standard of
the industry

CONCRETE AND ROAD
MACHINERY

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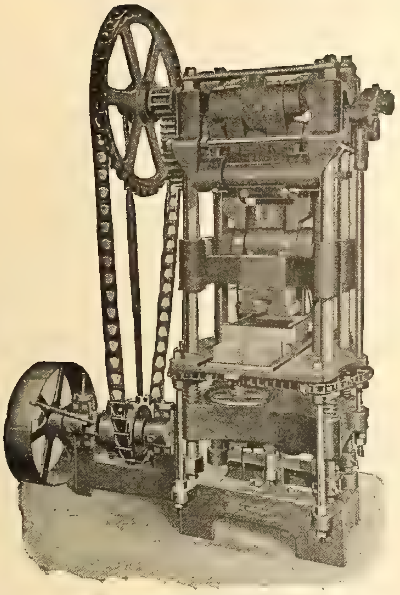

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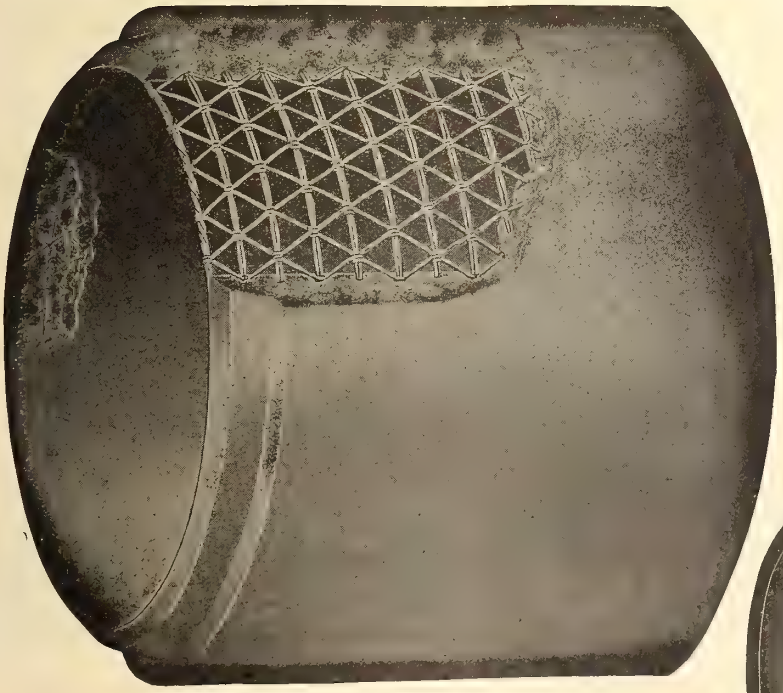

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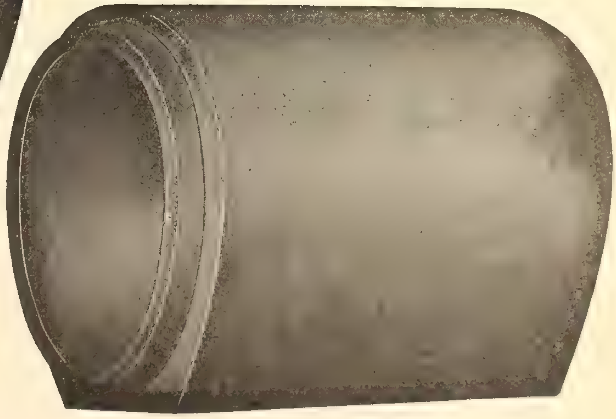

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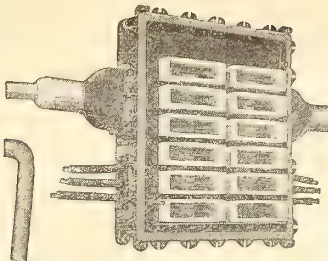

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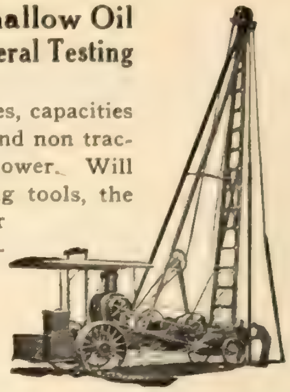

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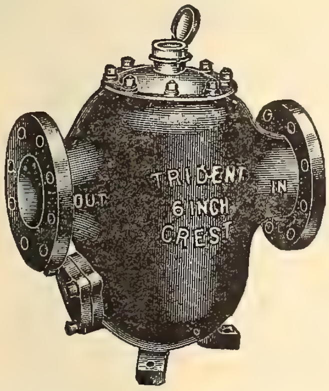

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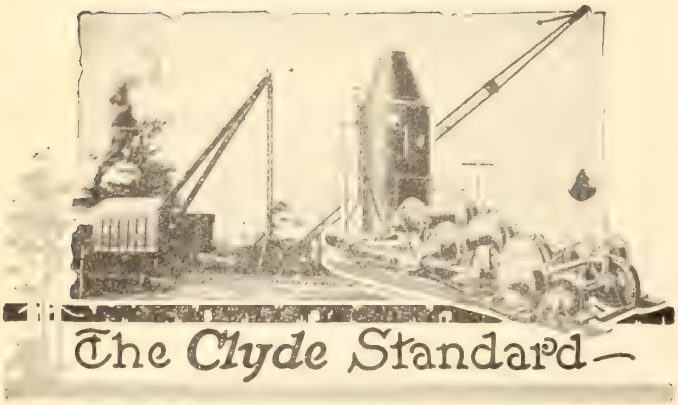
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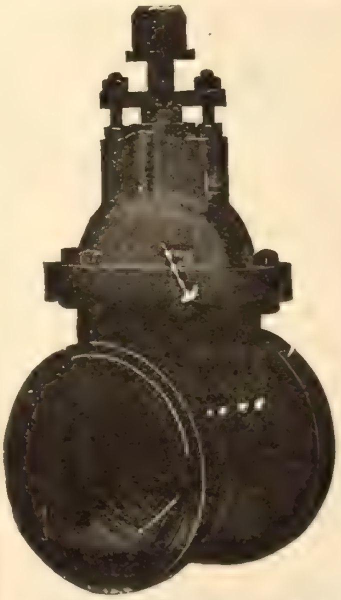

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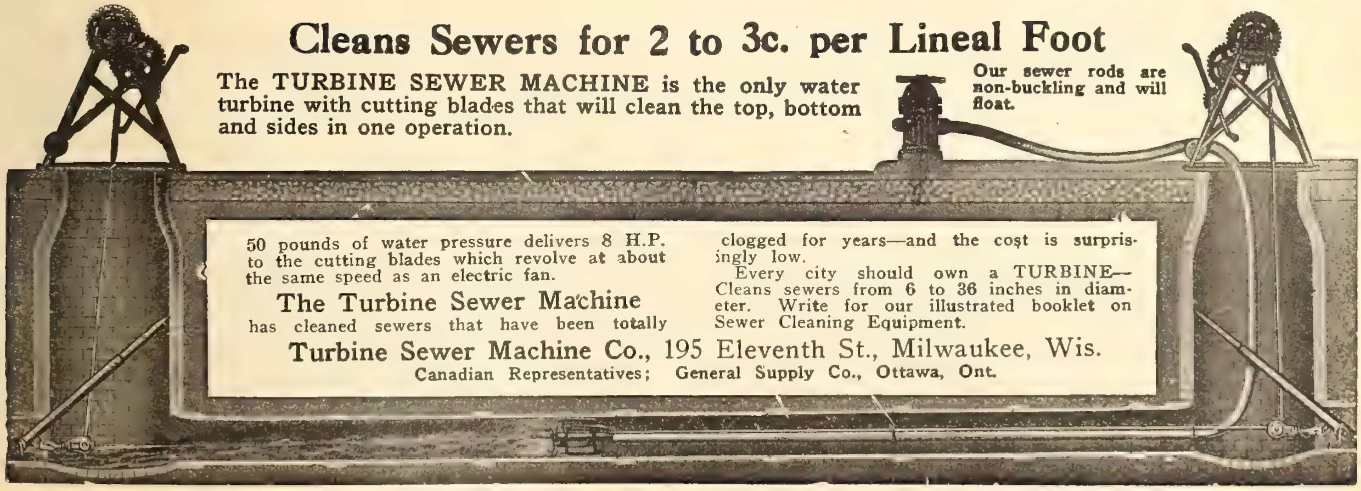

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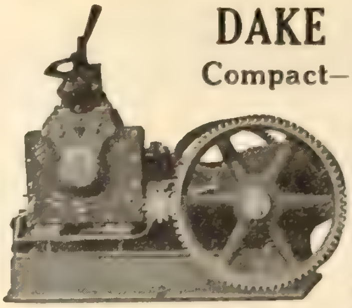

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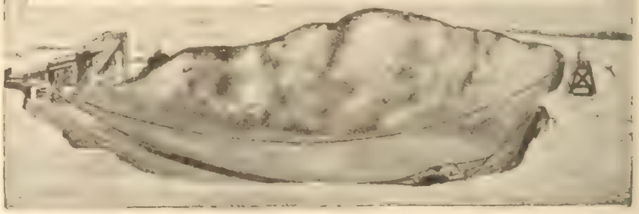

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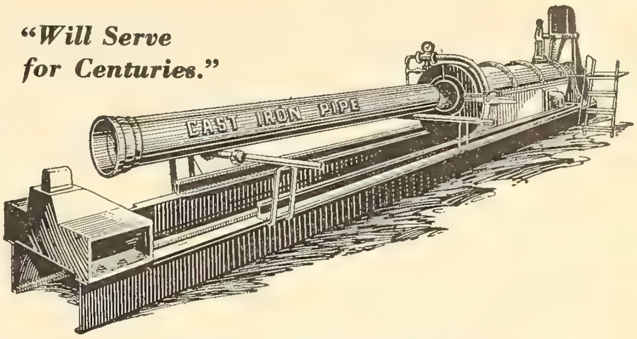

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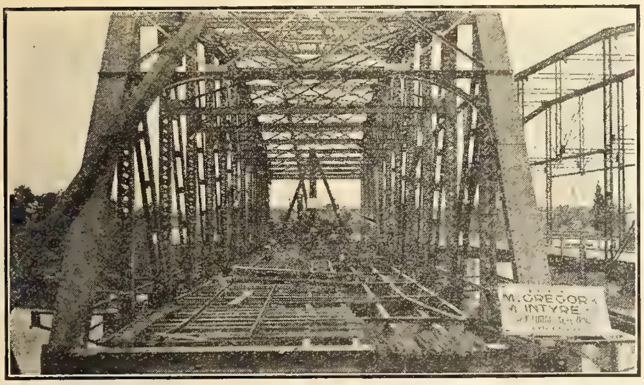

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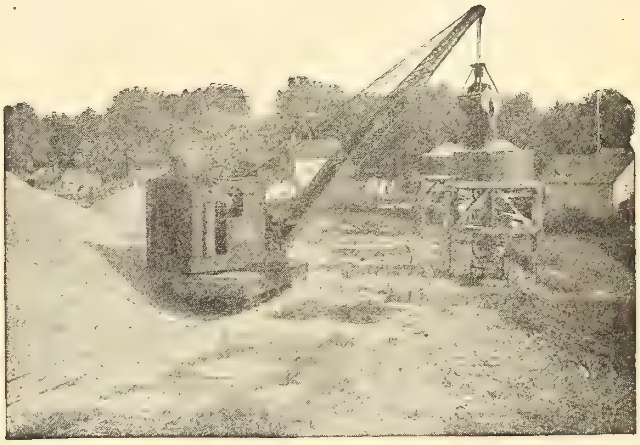

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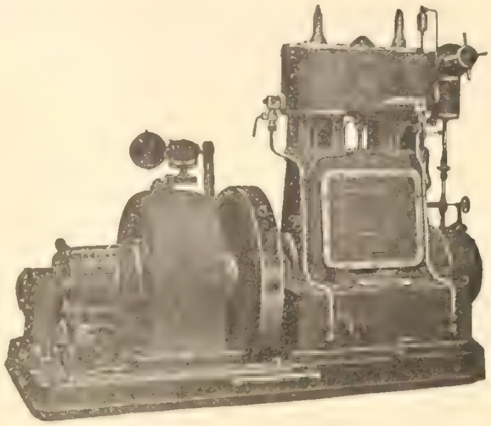

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Turnbull Elevators in appearance and performance are the elevators most suitable to apartment houses, public buildings, stores, etc., where they become part of the most exclusive surroundings.

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We specialize in the construction of wire rope for every requirement. Years of experience warrant us stating frankly that we offer the best to be obtained.

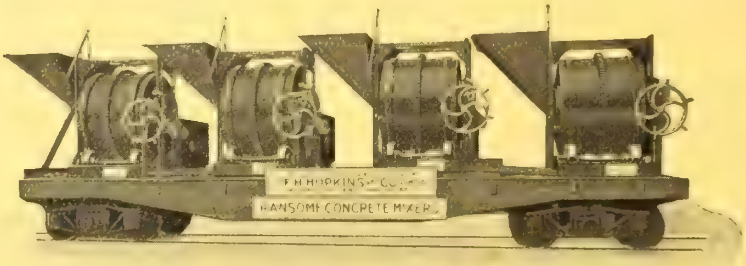
If you want wire rope that can be absolutely depended upon to give the most economical results, we ask you to specify "Dominion."

We carry a complete stock of all classes and sizes for prompt shipment.

Blocks — Clips — Thimbles — Turnbuckles, Etc.

The Dominion Wire Rope Company, Limited

Head Office: MONTREAL **Branches: TORONTO and WINNIPEG**



Twenty-five (25) one-yard "Ransome" Concrete Mixers

Used by the

Hydro-Electric Power Commission

For the Construction of the Chippawa Creek Canal

The very best mixers obtainable were desired to carry on this important work in record time—mixers which were efficient and durable and also which could be depended upon to stand up under extreme conditions and give at all times the results that satisfy.

That is why our "Ransomes" were selected. The desired results were obtained.

Total yardage of concrete on this project was 500,000 cubic yards.

When **you** are considering the purchase of a mixer—will you not let us tell you just what we can promise.

Yes—'tis true—"Ransome" Mixers cost more—but—they're worth it.

We build the best we know—if we could improve them—we would do it.

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Vol. 37 Toronto, January 17, 1923 No. 3

Contract Record and Engineering Review

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Can't be Held Open
To Waste Water

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FLUSH VALVES

SLOAN VALVE CO., LTD.
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Regulating

Alphabetical Index to Advertisers Page 16 **Classified Directory to Advertisements Page 6**

THE IDEAL CRANE FOR CONTRACT AND INDUSTRIAL WORK

THE new Link-Belt Crawler Crane has no superior for road work, excavating and material handling. It is an all-purpose crane. Lays its own track in soft ground, and readily climbs over irregular surfaces like a war-time tank.

Operates with hook-block, grab bucket, drag-line bucket, skimmer bucket, power shovel attachment, electric lifting magnet, wood grapple, or pile driving attachment. Weighs 22 tons, lifts 10 tons at 12 ft. radius, or 3 tons at 30 ft. radius. One man operates it. Write for specifications, price and delivery date.

Also send for Catalog No. 370, showing the standard line of Link-Belt Cranes.

CANADIAN LINK-BELT COMPANY LTD.

TORONTO. WELLINGTON & PETER STS
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LINK-BELT

LONDON COMBINATION MIXER NO. 4 & 6

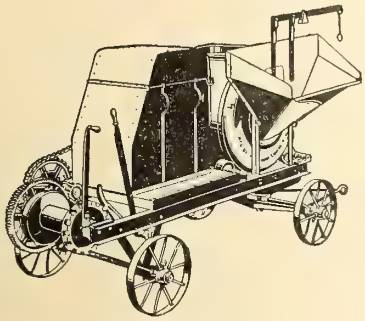

FIG. 25

LONDON CONCRETE MIXERS

ARE BUILT TO MEET THE NEEDS OF THE BUILDING INDUSTRY.

Fig. 25 illustrates the **London Combination Mixer** built in two sizes,—4 and 6 cu. ft. capacity. A Builders' Hoisting Drum is built in as a part of the machine.

Two Machines in one. It will mix any kind of concrete or mortar and hoist materials at the same time. Hundreds of Contractors use the hoisting drum to excavate their foundations and mix their concrete with the same machine. This is a convenient machine for all kinds of work requiring a capacity up to 60 yards of concrete per day. Fully described in Bulletin 49-D-1.

Fig. 33 illustrates **The London Heavy Duty Concrete Mixer** made in five sizes with Steam, Gasoline or Electric Power and equipped with Stationary Loading Hopper or Power Loader to suit the requirements of the Contractor. There may be cheaper Mixers but none better. Every one built to maintain their reputation for rapid work and long life.—**"ASK THE MAN WHO USES THEM."** Described in Bulletin 49-D-F.

LONDON HEAVY DUTY CONCRETE MIXER

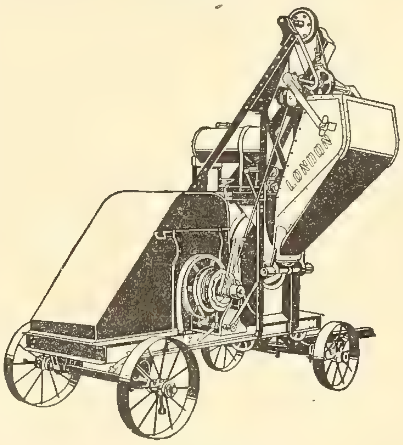

FIG. 33

LONDON CONCRETE CART NO. 6

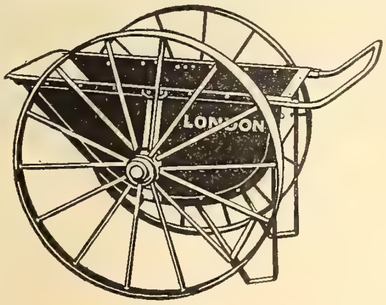

Fig. 83

LONDON CONCRETE CARTS are used almost exclusively because every one is built of the very best of materials. The design is one that has been universally adopted as the most suitable for all classes of concrete construction. Described in Bulletin O.

Made in Canada

We manufacture Concrete Mixers, Hoists, Air Compressors, Pumps, Brick, Block and Tile Machines, Barrows, Carts, Silo Moulds, Ornamental Moulds and Tools.

The London Concrete Machinery Co., Limited

Dept. 7 London, Canada

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The Cost of Less Than Heaviest Duty Construction

—is the high yardage cost, due to breakdown and delays, multiplying as the months go by—counter balancing profits earned—to say nothing about the fast depreciation and shorter service life on your mixer investment.

Koehring Mixers are built to the ideal that mixer ***dependability*** is the surest profit factor you can put on a job—and the Koehring record and reputation proves it.

—and the Koehring Paver—the Heavy Duty Paver—is the fastest paving unit.

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Montreal Office: 616 Canada Cement Bldg., Phillips Square. Phone Uptown 3026

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Construction Mixers: 10, 14, 21, 28 cu. ft. capacities, mixed concrete. Steam and gasoline. Write for Catalog C

Dandie: Light mixer, 4 and 7 cu. ft. capacities steam and gasoline. Low charging platform, power charging skip, light duty hoist. Write for Catalog D 28

Use IR Portable Air Compressors

—All the year round—

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Address Our Nearest Branch

"We feel sure that you will be interested to know that the 5 x 5 Portable Compressor outfit, mounted on a Ford truck, which we purchased from you has been entirely satisfactory.

This equipment was required in connection with the contracts we had with the City of Montreal and as it was urgent that this Compressor be in operation with the least possible delay, we drove it with our own men from *New York City to Montreal under its own power. A few hours after its arrival in Montreal it was actively at work, and has been in continuous operation now for over three months, working ten hours per day.

We have operated with this machine two of your type CC-25 Paving Breakers on all classes of paving, and have also used two of your BAR-33 Jackhamers in drilling rock, with very satisfactory results. At the present time we are using the machine for cutting out frozen ground.

This outfit has proved so satisfactory that in other cities we are having our order duplicated."

(SGD) G. M. Gest, Ltd., C. Masson, Vice-President.

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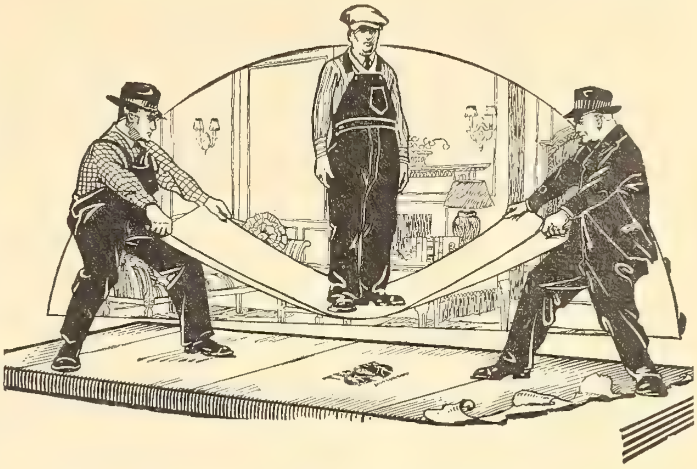

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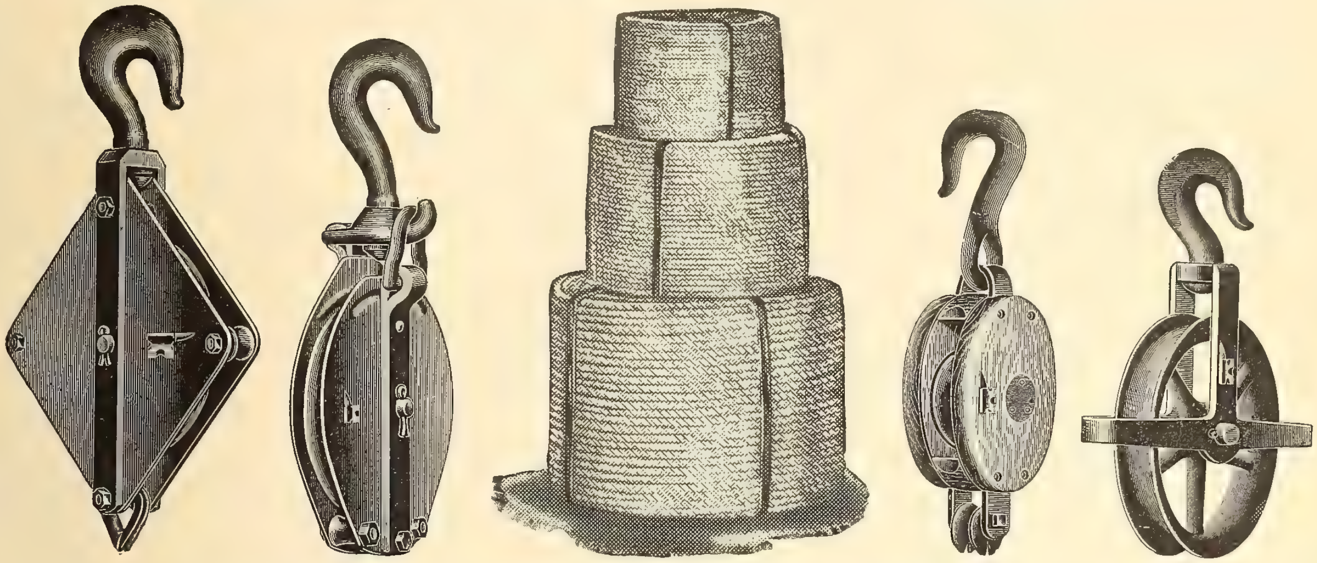

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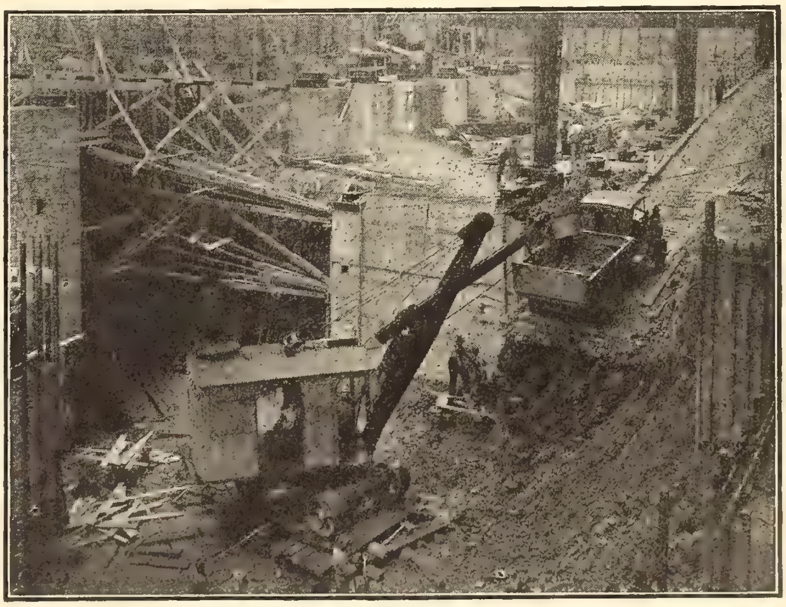

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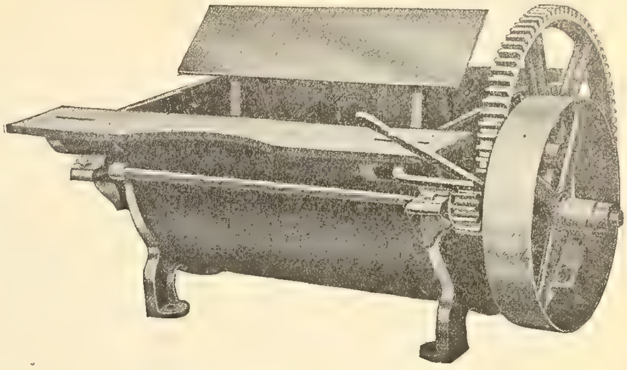

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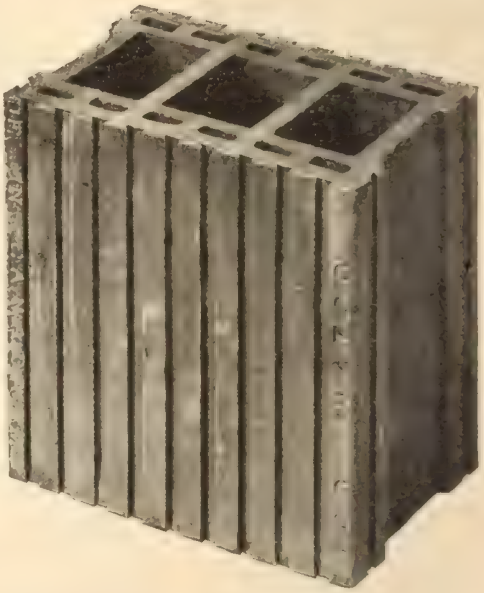

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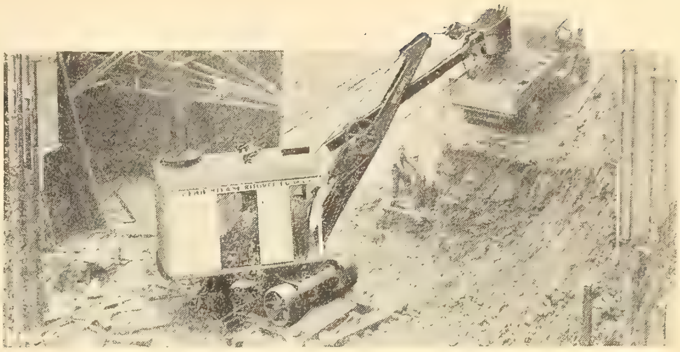

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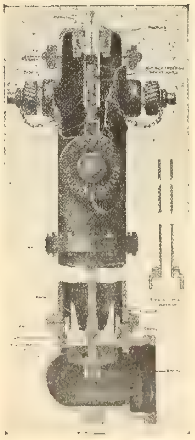

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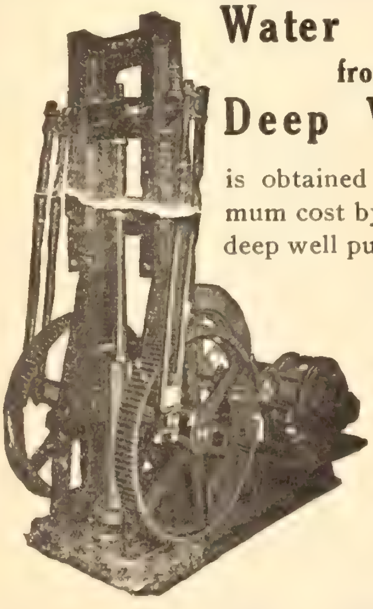

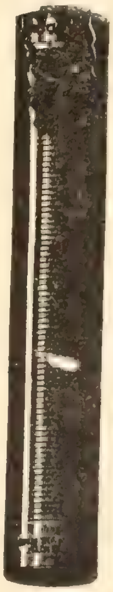

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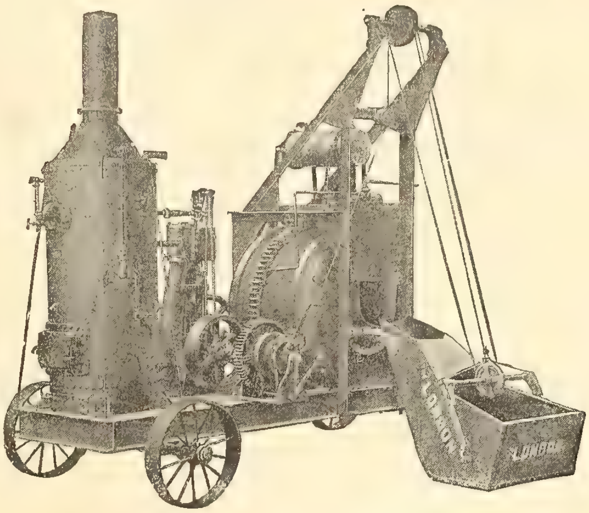

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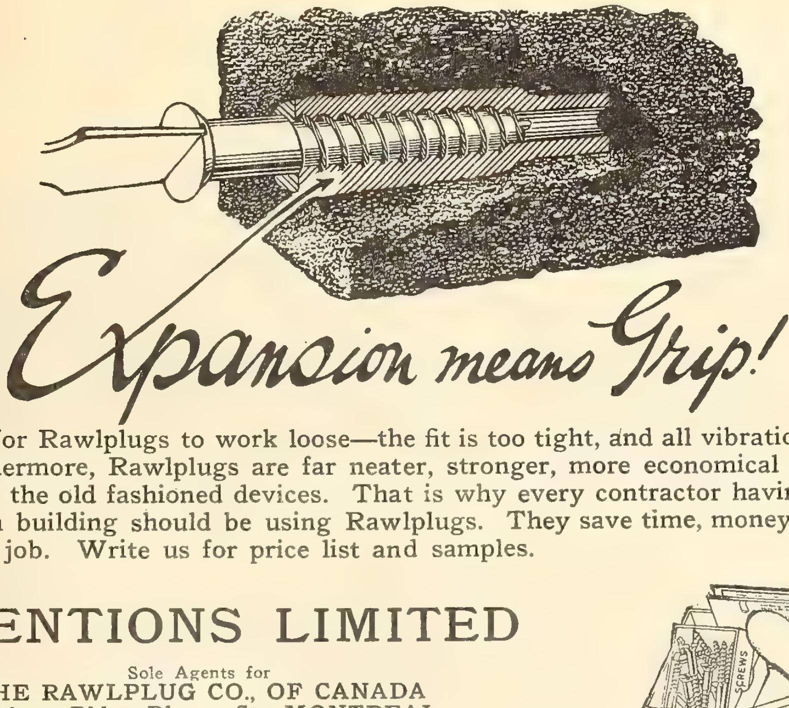
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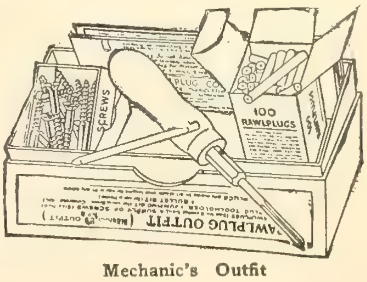

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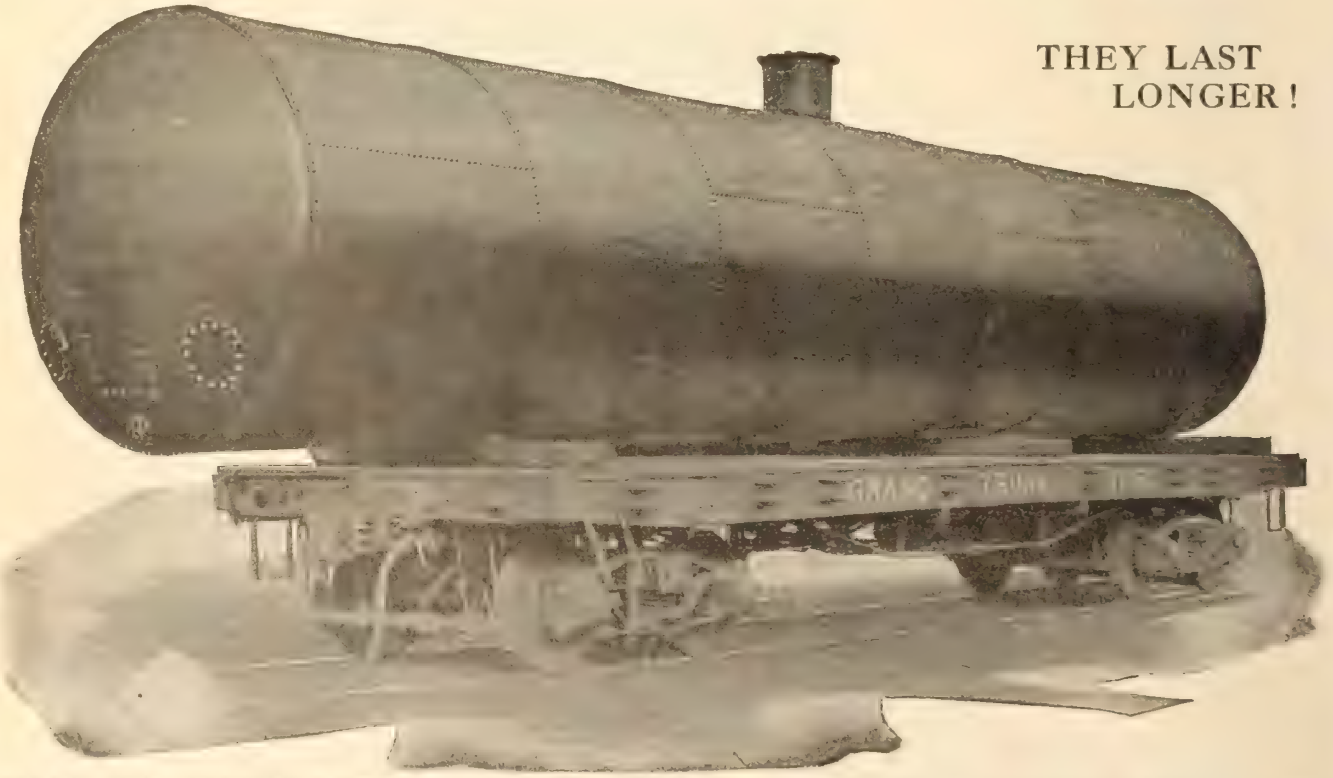

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Building Prospects for 1923

The number of contemplated and rumored projects which, it is expected, will go forward shortly, is really astonishing at this stage of the 1923 building season. On this account, it is quite reasonable to assume that the volume of building of all kinds will be very largely increased during the coming season.

The past year has been quite remarkable from a construction standpoint. With well over $300,000,000 worth of contracts awarded during the year, it is easily seen that there was a tremendous revival of all kinds of building. The increase over 1921 was about 40 per cent. The charts which were presented in the "Construction Review" number of the Contract Record (December 27) and also the figures in this issue indicate in what particular phases the construction activity of last year was noteworthy. Briefly, residential building tremendously increased, as did engineering also, while industrial building showed a sufficient advance over last year's figures to indicate that industrial activity is reviving sufficiently to require more manufacturing facilities. Only in business building was a decrease noted over 1921, but the amount is so slight as not to indicate any significant trend.

For 1923, the prospects are very promising. The need for buildings is still great and only by intensive construction can the demand be met. Regarding the price prospects, the compilers of MacLean Building Reports comment as follows, urging early commencement of building on the part of those who have plans ready:

"There is no escaping the logical conclusion that the shortages and increasing prices prevailing during part of 1922 will be duplicated this year. However, there is one simple expedient for forestalling the effect of delays and higher prices and really buying construction at a bargain. If people who intend building would do their planning immediately and place their contracts early, they would save much money. Those whose plans are ready, should place their orders now and give the contractors a chance to buy to the advantage of all concerned."

Concrete Mixers for Small Jobs

Hand mixing of concrete is now a rare thing except in repair or emergency jobs. Even on such, it has been observed that machine mixing is supplanting hand mehods to a constantly increasing extent and the time bids fair to come, it is ventured, when the hand system will be entirely a thing of the past. Not so very long ago concrete for even a great many fair-sized jobs was mixed by hand and very long and important were those clauses of the specifications that related to this part of the work. With the advancements that have been made in the machine mixing art, injunctions of that character have lost much of their importance, since a great many of the uncertainties of mixing have been removed by the adoption of mechanical methods. The machine mixer, properly operated, puts concrete manufacture on a basis of scientific accuracy—for uniformity, thoroughness and speed, it cannot be beaten.

The point of this comment, however, is a reference to the use of mixers on small jobs. In the "Construction Review" number of the Contract Record (December 27) this tendency was noted and illustrations and descriptions of small plants were presented. Thus, one development that was recorded was a mast hoist bucket equipment for the smaller concrete jobs, while another was a mixer especially built for sidewalk work—a line of construction in which hand mixing methods have long held sway. These examples are only typical of the current trend toward mechanicalizing concrete mixing, wherever possible. Mixers of small size are thus finding a ready sale and a wide use. When they are arranged with a wheel mounting the field of their application is vastly increased, for their portability makes it possible to use them for emergency and repair work. Several of the past year's offerings by manufacturers are of this character—mixers mounted on rubber tired wheels and so designed as to increase mobility.

"The Outlook for the Immediate Future is the Brightest that Has Been Before Us for Some Years"

L. H. Jordan

To the Architects and Building Contractors of Canada:

With the impress of the war and post-war period still to some extent upon us it is somewhat difficult to speak optimistically and truthfully; but the sooner we forget the past and take careful measure of the present the sooner will the spirit of prosperity possess us.

Western Canada has produced well this year and has built moderately. The need for buildings is far from being met and this need must and will eventually be met—but when? Undoubtedly a strong building movement will start when the building public becomes satisfied that a stable cost-level has been reached. The peak rise and fall in building costs that we have passed through could not be otherwise than a deterrent to building construction. The stiffening in prices in the latter part of 1922 following the low point earlier in the season should prove a stimulant if the present level can be maintained steady.

Latent building projects are numerous and many of these will take life almost certainly if costs stay steady. Stabilization has been the great need and there is every indication that we are at the beginning of it. The outlook for the immediate future is therefore the brightest that has been before us for some years. Let us hope indeed that building activity does not develop into a real boom to upset rational progress, of which there is no little danger. Both the designer and constructor of buildings can help tremendously in establishing mutual prosperity by co-operating in maintaining equitable prices, fair competition and just profits.

There is every reason to feel confident that good times are at hand for all engaged in the production of buildings in Canada.

L. H. Jordan, who gives the readers of the Contract Record this cheerful message writes with the authority of one of Canada's best known architects. Just a few months ago, Mr. Jordan, who hails from Winnipeg, was elected president of the Royal Architectural Institute of Canada.

By this means, such equipment may be quickly hauled from one job to another, attached to a motor truck, the resilient mounting serving to permit speed of travel and to prevent the machine and road from damage.

On these small mixers, gasoline engines are generally the motive power. Under the conditions under which the machines are used, gasoline has certain advantages and it is for this reason that there has been noted an increased use of gasoline driven mixers.

The initial outlay and the cost of upkeep of a mixer for the small job is not so great that a contractor cannot afford one or more of them as the volume of his work justifies. No contractor, it is safe to say, who has made any extensive use at all of such equipment, would go back to hand methods. So much superior, indeed, is the quality of the concrete and so much speedier is the operation of mixing that the small mixer has become an absolute necessity in construction operations.

The Association of Canadian Building & Construction Industries have drawn up a tentative programme for their Fifth Annual Conference, to be held at the Chateau Frontenac, Quebec City, on February 6 to 9. Some of the important items listed on this programme are: An address by E. G. M. Cape, Montreal, on "What's the Matter with the Building Industry;" an address by Jno. V. Gray, Toronto, on "Right Relations with Our Workmen." J. P. Anglin, Montreal, will discuss "Seasonal Employment in the Building Industry," while J. M. Pigott will speak on "The Shortage of Mechanics and the Cure." Other features of particular interest will be a tour over the new Chateau Frontenac additions and a trip to the Quebec Bridge by special train. In addition there will be an intimate discussion of some of the problems that are affecting the construction industry. The committees which have the problems in hand will present important reports. The entertainment features of the program are not being overlooked and delegates can rest assured that they will be well looked after.

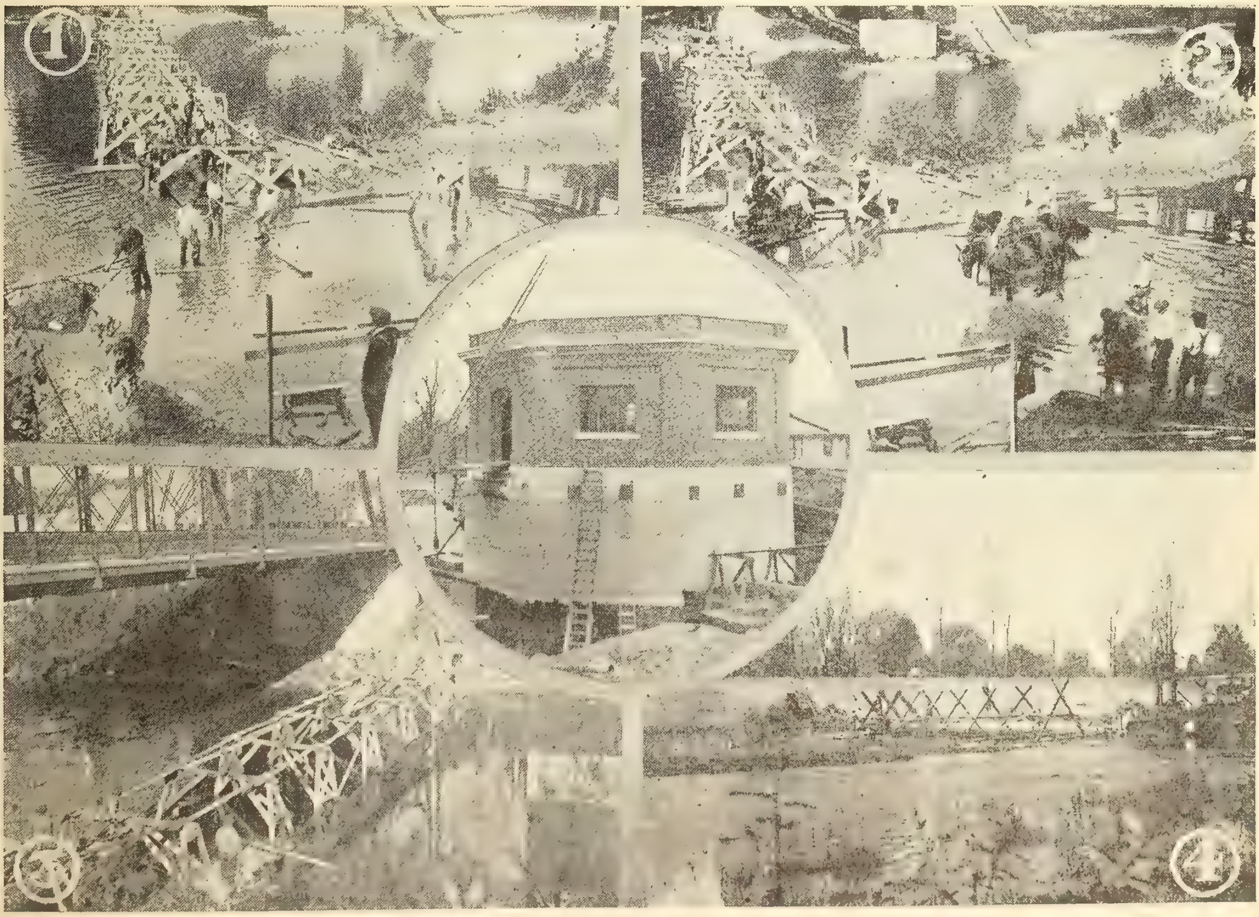
Sanitary and Storm Sewer System for the City of London, Ont.

Recently Completed System of Separate Sewers Serving an Area of 445 Acres is Designed to Care for Future Development—McCracken and Reinforced Concrete Storm Sewers, Vitrified Clay Sanitary Sewers and Cast Iron Inverted Syphons

By H. A. BRAZIER, M.E.I.C.
City Engineer, London, Ont.

The municipality of the city of London has just completed the construction of a sanitary and storm sewer system for the portion of the city known locally as London West. The area of the section served is about 445 acres and is situated mainly west and north of the right angle formed by the north branch and main stream of the River Thames. The low-lying district lying on the opposite bank of the river to the east and south-east is also included in the system, connection being made by three inverted syphon lines at the river crossings. The general elevation of the main area is 54 feet above city datum, with a low elevation of 51.5 feet. The high water level of the river opposite this area is about 57 feet and the low water level is 40 feet. Thus the general elevation is 14 feet above low water level and 3 feet below high water level. During the flood of 1883 this section of the city was completely flooded, houses and other property being demolished. Protection from flooding was, therefore, deemed necessary and an earth revetment or dike was constructed around the east, south and a portion of the west side. Protection is afforded on the north and north-west by the natural rise in the ground elevation.

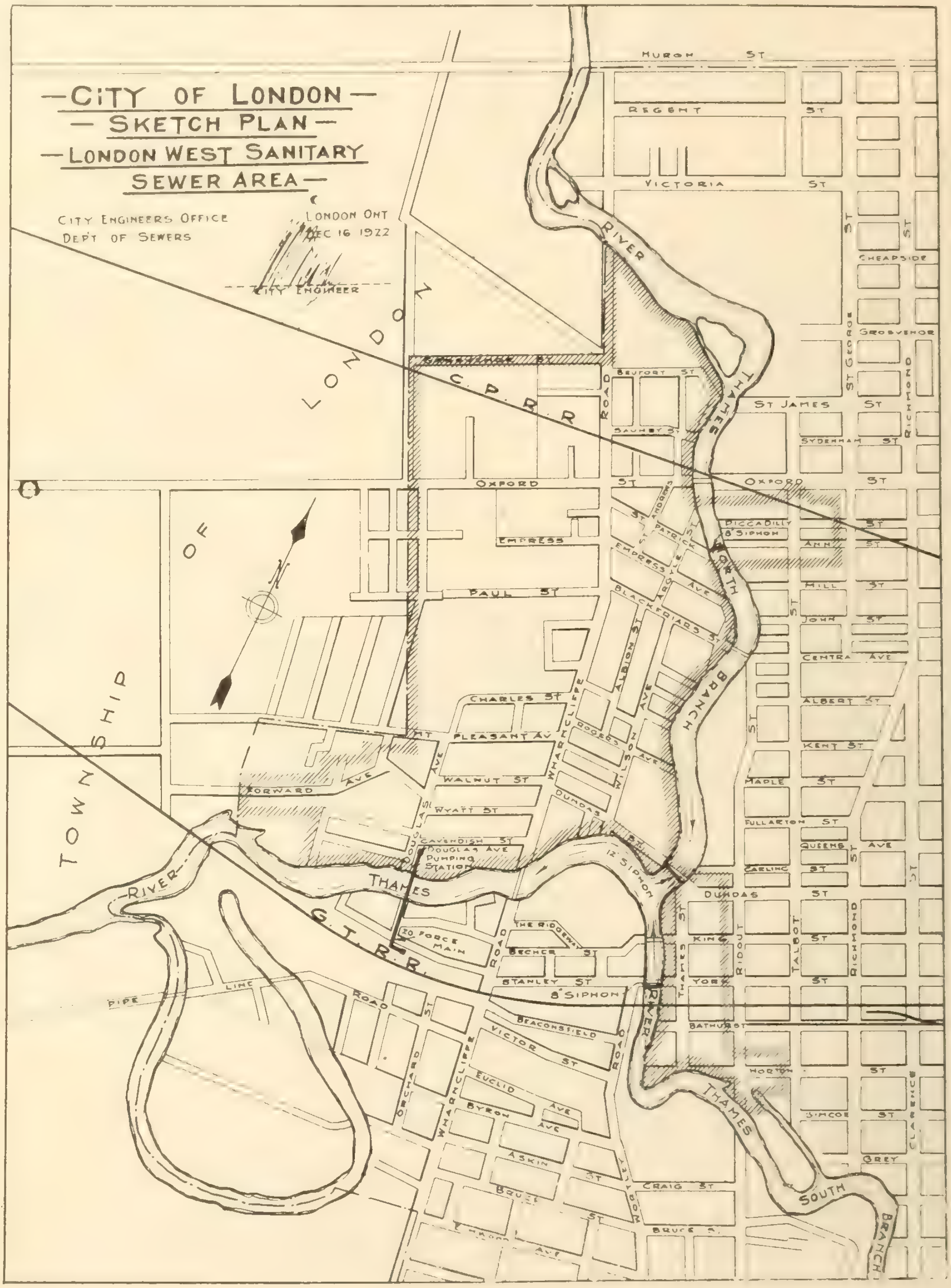
The present population of London West and



Figs—1 and 2—Construction of the Dundas St., syphon, 344 ft. long. Fig. 3—An 8 in. syphon at York St., under construction. Fig 4—A similar one being laid at Ann St. Centre—The Douglas St. pumping station areas contributary to this system is 7,125 or a density of population of approximately sixteen persons per acre.

Separate Sanitary and Storm Sewers

The low elevation and slight slope of land on the main line of the system, necessitating the construction of the trunk sewers below low water level, together with the possibility of making storm water outfalls on two sides of the area to be drained, decided against a combined system. A strictly separate system of sanitary and storm sewers was therefore adopted.



In designing the sanitary sewer system provision was made for sewers of sufficient capacity to take care of the whole of the district, taking future development into account. This area was estimated at 500 acres, with an average density of forty-five persons per acre or a future population of 22,500 persons. The water consumption was estimated at 84.8 gallons per twenty-four hours per capita; the capacities of the sewers were designed for three times this amount, to which was added 1,000 gallons per twenty-four hours for infiltration. This figure was set very high on account of the anticipated severe conditions under which the work would be carried out and the consequent difficulty in making the work water tight. The total estimated flow for this future area is approximately five and a half million gallons per twenty-four hours.

The sub-soil is mostly gravel over yellow clay. Considerable quantities of water were met with during construction of the main sewers and, in the higher portions of the section, quantities of running sand were encountered. The actual quantity of water due to infiltration is less than half that estimated and, as leaks which are mainly in the manholes are discovered and repaired, this quantity will be still further reduced.

Minimum Velocity

In designing the system it was deemed advisable to fix a minimum velocity. This was fixed at 2½ feet per second and wherever possible a grade producing a velocity of from 3 to 3½ feet per second was obtained. With only one exception 2½ feet per second was the minimum velocity.

All sanitary sewers were constructed of vitrified fire clay pipes, supplied by the Clay Products Agency Ltd., of Toronto.

The inverted syphon lines were constructed of cast iron, jointed with lead. The vitrified pipes were jointed with "super" cement and laid in the dry. In many cases it was necessary to lay under-drains to accomplish this.

The small lateral sewers are 8 inches in diameter and comprise about 74 per cent. of the total sewers laid. The laterals and main sewers increase in size to 27 inches, the diameter of the main trunk sewer. The private drain connections, of which 8.69 miles were laid, are 6 inches in diameter in every case.

The following lengths of sewers were constructed:

8 inch vitrified pipe	37,372	feet
10 inch vitrified pipe	3,175	feet
12 inch vitrified pipe	2,181	feet
15 inch vitrified pipe	2,812	feet
18 inch vitrified pipe	1,026½	feet
21 inch vitrified pipe	1,109½	feet
24 inch vitrified pipe	1,275	feet
27 inch vitrified pipe	1,827	feet

The total length of sanitary sewers constructed was 50,778 feet or 9.62 miles exclusive of private drain connections.

The 27 inch trunk sewer terminates at the Douglas Avenue pumping station. The discharge from the pumping station is through approximately 1,000 feet of 20 inch cast iron force main, taking the form of an inverted syphon. The elevation of the lowest point in the syphon is 29.75, a depth of 10.75 feet below the invert and 31.5 feet below the outlet. The difference in levels between the inlet and the outlet of the force main is 20.75 feet.

The three inverted syphons which connect the low-lying land on the east side of the river with the main area were constructed of cast iron pipe. The syphon at Dundas Street was 12 inches in diameter with a total length of 344 feet and a maximum depression of 13.6 feet; Figs. 1 and 2; at York Street 8 inch diameter, length 194 feet, maximum depression 17.75 feet; Fig. 3; and at Ann Street 8 inch diameter, length 413 feet, maximum depression 13.1 feet, Fig 4. In each case a manhole was built at the lowest point, enclosing a valve for cleaning and flushing the syphon when necessary.

The pumping station was erected by John Hayman & Sons of London, the London Concrete Machinery Co. supplying the pumps, which were of the Aurora type, direct connected to 35 h.p. Crocker-Wheeler motors. They were made by the Aurora Pump & Mfg. Co., Aurora, Ill. The 20-inch force main was constructed by the McKnight Construction Co., of Toronto. The Ann street syphon line by the Webster Construction Co., of London. The remainder of the work, that is, the actual sewer construction, was carried out by day labor; a portion of the work formed a part of the Government Unemployed Relief scheme for the winter of 1921-1922. Work was commenced in February 1921 and was completed in September 1922.

The cost of the work on the sanitary system to date is as follows:

Pumping station and equipment ..	$ 48,139.00
20-inch force main	12,661.00
3 river crossings and overflow to existing sewers	7,888.00
Mains, manholes and private drain connections	256,290.00
Engineering, compensation, etc. ..	6,297.00
TOTAL COST	$331,275.00

The Storm Sewer System

The storm water system to date consists of three miles of sewers varying in size from 8 inch to 48 inches in diameter, the sewers being constructed of concrete pipe supplied by the Independent Concrete Pipe Company, of Woodstock, Ontario. The smaller sizes were of the McCracken type; 27 inch and larger were reinforced concrete pipe. All sewers were laid to grades sufficient to give a self-cleansing velocity.

There are four outfalls discharging into the River Thames about two feet above low water level and submerged about 16 feet in extreme high water level. These outfalls are, therefore, protected against flooding from the river by tidal flap valves. A manhole was built behind each valve.

The storm sewer system was constructed wholly by day labour. A portion of this system was also included in the unemployed relief system for the winter of 1921 and 1922. The total cost of the system up to the present is $71,127.65.

Estimating the Cost of Timber Construction

Practical Data that Will Aid the Estimator in Figuring the Cost of Handling, Framing and Erecting Lumber in Mill and House Types of Construction

By CHAS. F. DINGMAN

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When I first considered the writing of this series, I was struck by the paucity of the published data available regarding the cost of timber framing. True, a great deal of information has been published but it is all on the basis of the cost per thousand feet B. M.

If all designers used the same details in mill construction, for instance, then a figure per thousand feet for that type would have a real value. However, rather costly experience has shown me that the only safe way to determine the probable cost of a sizeable job of mill construction is to determine the several operations that must be performed on each stick and to estimate them separately.

This is not as formidable a task as it sounds, since there are generally a great number of sticks all exactly like one another in every mill-construction building. That is, on any floor most of the columns will be alike, most of the inner rows of floor timbers will be alike and most of the outer rows of floor timbers will be alike. Therefore, having found the cost for one stick, it is only necessary to multiply it by the number of similar sticks.

I have in mind a recent instance of a building. The cost of framing it was figured on the basis of figures taken from previous experience and those figures very closely approximate certain previously published cost figures. The estimate was:—

2 Carpenters 8 hrs. each at .85	$13.60
3 Laborers 9 hrs. each at .45	12.15
To frame 2000 FBM	25.75
Estimated Cost per M	13.88

The actual cost was over $20.00 per M and the job superintendent claimed that the number of operations on each stick made it impossible for him to show a lower cost.

You will note that the term "framing" as used so far includes the actual framing operations as well as the operations of erecting, and most published data follow the same plan. Experience has shown me that it is wiser to estimate the cost of those two distinct operations separately. If you get into the habit of figuring each distinct operation separately, you will find that the temptation to "lump" and guess is greatly lessened and that your estimates more nearly approach your actual costs. Use your "costs per thousand" as a check on your detailed figures, if you like, but be sure to study the details.

A previous article has shown how to compute the cost of hauling materials when the weight is known, so if you know the weights of the various kinds of building lumber, you can readily figure the cost of hauling it from a car or yard to the work. Table 1 gives that information.

TABLE 1.—Weights of Timber

(Lbs. per 1000 FBM)

	Rough	Dressed
Yellow Pine	4400	3500
Chestnut	3050	2850
Red Oak	3350	3140
White Oak	3575	3250
Spruce	1860	1740
Hemlock	1860	1740

Of course, the cost of handling varies greatly, depending upon whether the lumber is taken from a box-car, a gondola, or a flat-car, or whether it is taken from a pile. The types of trucks or wagons used also have an effect upon the cost; for instance, the "roller-dump" type of trucks and wagons used in many places can be unloaded in less than a minute, while other types require a very appreciable time for unloading.

Costs of handling timber from cars to trucks may be figured from Table 2.

TABLE 2.—Average Costs on Unloading Timber and Lumber from Cars

(Labor Hours per 1000 FBM)

	From Flat car	From Gondola car	From Box car
Heavy mill timbers,	1.0	1.5	1.0
House framing,	0.4	0.5	0.5
Floor and roof plank,	0.6	0.7	0.7
Boards,	0.4	0.5	0.5
Flooring,	0.7	0.8	0.8

Unloading from truck to pile will be two-thirds of the time required from flat-car to truck.

Mill Construction

Scaling the quantities for a mill construction building is a comparatively simple operation, but estimating the cost is not so simple, since, on a carpenter's wage rate of 70 cts. per hour, the cost per thousand feet B. M. may easily vary from $7.00 to over $20.00.

This is all explained by the variation in details. One designer uses joint-bolts to hold a cross-tie for the building, another uses dog-irons, another depends entirely upon the lag-bolts in the column-caps. Some designers use cast-iron pintles to carry the load of an upper column to the capital of the column below, while other designers permit the column itself to come down into the capital.

All of these variations in design introduce operations which must be considered when estimating. Table 3 gives the time in hours of carpenters' time for a number of different operations. Where the operation, such as cross-cutting, requires two men, proper allowance has been made in the table so that the figures may be used without change.

TABLE 3.—Framing Mill Timbers. Time in Hours of Carpenter's Time

	Thickness of Timber				Any Size
	8"	10"	12"	16"	
Cross-cutting, per inch of depth	0.04	0.05	0.06	0.07	
Ripping, per lin. ft.	0.14	0.16	0.20	0.28	
Chamfering, per lin. ft.					0.02
Drilling ¾" or smaller holes,			0.02		
Drilling 1" holes,			0.03		
Drilling 1½" holes,			0.04		
Cutting mortise for knee brace,					0.30
Cutting V-notch for pintle	0.22	0.26	0.30	0:42	
Cutting square notch for post	0.25	0.30	0.35	0.50	
Cutting Mortise for joint bolt	0.10	0.12	0.15	0.20	
Cutting notch for hook plate	0.12	0.15	0.18	0.20	

The figures in the table include an allowance to cover the time of shifting the boring-machine and other tools, as well as moving the sticks into working position, turning them as required, and also moving the stick out of the way when framing is completed.

An example of the method of figuring the cost of framing is as follows:

The floor beams in a certain silk-mill are 10 x 18's, 24'-0" long. They are carried on duplex hangers at one end and on hook plates at the other. The table only takes in sizes as high as 16", so we will make proportionate allowances where necessary.

Plumb-cut at girder end	0.90 hr.
Fire-cut at wall end	0.90 hr.
Notch for hook plate	0.15 hr.
Chamfering 2 under corners, 22 ft. each	0.88 hr.
	2.83 hrs. at $1.125=$3.18

Each stick contains 360 FBM; therefore the cost of framing 1,000 FBM would be $8.83 for the floor beams.

The girders are 10 x 18's, 16'-0" long, carrying a beam on each side every eight feet, the beams being supported by hangers which are let into the sides of the girders by two holes. The girders have a plumb cut on each end. The cost is, therefore:

Plumb-cuts both ends	1.80 hr.
Drilling 4 holes for beam hangers, holes 4" deep	0.16 hr.
Drilling 4 holes for dog-irons	0.04 hr.
Chamfering 2 under edges	0.56 hr.
	2.56 hrs. at $1.125=$2.88

Each stick contains 240 FBM, so the cost per thousand is evidently $12.00 for the girders.

The columns are 10 x 10's, 12'-0" long, requiring only square cuts at top and bottom to fit into iron bases and caps. Their cost is:

2 square cuts	1.00 hr.
Chamfering 40 lin. ft.	.80 hr.
	1.80 hrs. at $1.125=$2.03.

Each column contains 100 FBM, so the cost is evidently $20.30 per M for the columns.

This brings out one of the most dangerous features of the usual method of figuring on the basis of an assumed average hourly production or a cost per thousand feet. The columns, though each of them requires considerably less work on it than each of the floor beams requires, cost more than twice as much per thousand feet. This is simply because the columns each contain less than half as many board feet as the beams do. This same condition exists throughout most jobs; for instance, a 6 x 6 column will contain only one-fourth as much material as a 12 x 12 column, yet the cost of framing it will probably be more than half as much as the cost of framing the 12 x 12. This will result in a cost per thousand that will be twice as high for the small sticks as for the large ones.

This same mill has a truss-roof on the top storey. Each truss contains:

Chords,	6x8	1/22-0	1/26-0	192
Rafters,	6x8	2/24-0		192
Struts,	6x6	2/8-0	2/7-0	90
	4x6	2/6-0		24
				498

The labor-cost of assembling one truss will be:

End cuts on chords and rafters,	1.92 hr.
End cuts on struts,	2.16 hr.
Boring chord and rafter for 4 end bolts,	0.22 hr.
Boring chord and rafter for 5 truss rods,	0.20 hr.
Boring chord for 12 splice bolts,	0.18 hr.
Boring chord and rafter for struts,	3.00 hr.
Notching chord and rafter for rods, etc..	3.50 hr.
Bolting-up truss,	2.00 hr.
	13.18 hrs. at $1.125=$14.83

Since the truss contains 498 FBM, the cost per thousand FBM is evidently $29.78.

Erecting Timber

So far we have only figured the cost of framing, we must still estimate and add in the cost of the erection.

The cost of erection is a very variable item and will depend upon the equipment available, the height to which the timber must be raised above ground, the distance between timbers, and whether or not most of the work can be done by common laborers instead of carpenters.

While framing timber is very properly a carpenter's job, there is no good reason why practically all of the work of erection cannot be done by good laborers, working under a competent carpenter foreman. However, in certain districts, the unions may enforce regulations requiring that the work be done by carpenters.

For most mill jobs, the best sized gang will consist of eight men, using a hand-powered "wheel-derrick" and working as follows:

I foreman,
4 laborers operating the derrick,
1 laborer tending guy line,
1 carpenter putting the timber in place,
1 laborer helping the carpenter,

Such a gang can handle timbers containing up to 400 FBM, each at the following speeds:

TABLE 4—Erecting Timber

(Time for Full Gang as above)

Shifting Derrick Horizontally,	2 feet per minute
Raising Timber Vertically,	3 feet per minute
Setting Timber in Place,	Average 5 minutes

These unit times contain a sufficient allowance to cover the ordinary small delays that occur in a day's work, but do not provide for any major contingencies.

Individual timbers containing over 400 FBM are seldom encountered in ordinary mill construction (though we once handled a mill in Paterson, N. J., with timbers of 1,728 FBM each, which is very exceptional) and the cost of erection per stick will advance practically one and one-half times its proportionate size beyond 400 FBM.

On the other hand, it takes practically as long to erect smaller timbers, until their size gets down below 200 FBM each, so the cost of erection per thousand feet becomes less as the size of the individual sticks increases until it reaches 400 feet per stick, after which it again advances.

In multi-storey buildings there will usually be a steam-engine or electric-motor on the job for use in raising other materials and it can also be employed in getting the timber onto the upper floors, from whence it can be erected by the hand-powered derrick. In some cases the entire erection is handled by a power-derrick, but I believe the number of instances where this can be done economically is comparatively few.

Where the hoisting-engine is employed to lift the timbers onto the floors it is usual to wrap the line around the winch or "nigger-head." Working this way will require two men on the ground to "load" the timber, two men on top to "unload," one man to tend the winch and the engineer to operate the derrick. Such a gang should "load" and "unload" in a total of three minutes and should handle loads averaging 800 FBM at a speed of twelve vertical feet per minute.

Applying these figures to the building under consideration, we get the following costs:

Cost of "Wheel-Derrick" Gang Per Hour

Foreman	$1.25
6 Laborers at .45	2.70
Carpenter	1.12½
	$5.07½

Cost of "Power Hoist" Gang Per Hour

Foreman (working)	$1.25
3 Laborers at .45	1.35
Guyman	.50
Engineer	1.00
Engine	1.00
	$5.10

Erecting Second Storey Timbers, (from first floor)

Timers are 8-0 c. c.

Shifting derrick,	4 minutes
Raising timber,	4 minutes
Setting timber,	5 minutes
	13 minutes=0.22 hr.

The third and fourth storey timbers will take the same length of time to erect, plus the time taken to bring them to the floors from which they are erected.

Thus third storey timbers will require the time of the "power hoist" gang for each "load" as follows:—

Load and unload,	3 minutes
Hoist,	1 minute
Total,	4 minutes or 0.07 hr.

The fourth storey timbers will require one additional minute of hoisting time, making 5 minutes, or 0.084 hour.

The cost of erecting, exclusive of hoisting, is therefore:—

For beams, 0.22 hr.x$5.07½÷360=$0.31 per M.
For columns, 0.22x5.07½÷100=$1.12 per M.
For girders, 0.22x5.07½÷240=$0.46 per M.

From their sizes it can be seen that two beams or three girders will just about make a "load" for the hoist. The columns could be hoisted eight at a time, so far as weight is concerned, but their shape makes it unlikely that more than four will be handled at once. Therefore, the third storey hoisting cost will be:

For beams or girders, .07hr.x$5.10÷720=$0.50 per M
For columns, .07 hr.x$5.10÷400=$0.89 per M.

The fourth storey hoisting cost will be:—

For beams or girders, .084 hr.x$5.10÷720=$0.60 per M.
For columns, .084 hr.x$5.10÷400=$1.08 per M.

In handling the trusses, the time for shifting the derrick will be the same as before, but even though each truss contains only 498 FBM, the time taken in hoisting and erecting it, because of its size and shape, will be twice as long as for a stick, and the time placing is three times as long. Since all the trusses go on one level, we can figure them as follows:

Hoisting Gang Time,		
Load and unload,	6 minutes	
Hoisting 36 feet,	6 minutes	
	12 minutes or 0.20 hr. @ $5.10	=$1.02
Wheel Derrick Gang,		
Shift derrick as before.	4 minutes	
Raising truss,	12 minutes	
Setting truss,	15 minutes	
	31 minutes or 0.51 hr. @ $5.07½=	2.60
Total		$3.62

which equals $7.27 per M.

Note. For convenience sake, it might have been better, as well as cheaper, to have hoisted the individual parts of the truss to the top floor and then assemble and erect them there. Where the element of time does not make it necessary to have the trusses ready to erect as soon as the walls can receive them, it will usually be found most economical to assemble them on the floor from which they are erected.

Summarizing the costs computed thus far, we get the following costs per 1000 FBM:

	Framing	Hoisting	Erecting	Total
Beams,				
2nd Floor,	$ 9.09	$	$0.31	$ 9.40
3rd Floor,	9.09	0.50	0.31	9.90
4th Floor,	9.09	0.60	0.31	10.00
Girders,				
2nd Floor,	12.00		0.46	12.24
3rd Floor,	12.00	0.50	0.46	12.96
4th Floor.	12.00	0.60	0.46	13.06
Columns,				
1st Floor,	20.30		1.12	21.42
2nd Floor,	20.30	0.89	1.12	22.31
3rd Floor,	20.30	1.08	1.12	22.50
Trusses,	29.78	2.04	5.23	37.05

Liability and compensation insurance, as well as overhead items and contingencies must, of course, be added to these figures. It must also be remembered that we have only figured the cost after the timber was delivered to the site of the work and that the cost of delivery must be computed separately.

Since, counting the working foreman as a carpenter, the usual average throughout such a job as this would be 1½ laborers to a carpenter, a much more usual method of figuring is as follows:

1 Carpenter 8 hrs. @ $1.12½,	$ 9.00
1½ Laborers 8 hrs. @ .45,	5.40
Cost to handle 1,000 FBM,	$14.40

This figure is to include framing hoisting and erecting. To get the average for the building we have been studying we will figure as follows:

Second Storey	
13,000 FBM. beams, @ 9.40,	$122.20
2,200 FBM. girders, @ 12.46,	27.41
900 FBM. columns, @ 9.90,	8.91
Third Storey	
13,000 FBM. beams, @ 9.90,	128.70
2,200 FBM. girders, @ 12.96,	28.51
900 FBM. columns, @ 22.31,	20.08
Fourth Storey	
13,000 FBM. beams, @ 10.00,	130.00
2,200 FBM. girders, @ 13.06,	28.72
900 FBM. columns, @ 23.39,	21.05
Trusses,	
9,000 FBM. @ 37.05,	333.45
57,300 FBM. @ average of $15.00,	$849.03

This would indicate that the error in the short method is less than 5% when the conditions are all as outlined in our present example, but we can only tell what the error would be in each other instance by working it out in detail.

Builders' Iron Work

Computing the quantities of builders' iron-work is ordinarily a very simple operation, the exact method to be used depending largely upon the kinds of iron-work called for. For instance, if any of the ready-made or patented types of joist-hangers, beam-boxes, column-caps, column-bases and similar members are called for, the simplest method is to make a list of the various items required and get a price on the list, either from a catalogue or price-list or by inquiry from persons dealing in such goods.

When the iron-work consists of members made up of ordinary sizes of rod-bar, or flat-iron, the weight can easily be computed by means of the tables in such hand-books as Cambria, Carnegie or Lackawanna, or if no hand-books are available, all of the various sizes can be figured to the equivalent of one-inch square bar, which weighs 3.40 lbs. per lin. ft., and the total weight thus readily calculated. Manufacturers of such iron-work will usually be glad to give a unit-price per pound of lists sent them for price, or a unit-price per piece on each of the various items.

Where castings of any ordinary types, such as bases, caps, bearing-plates, pier-plates, etc., are used, unless a price per piece can readily be obtained, the contents of each piece in cubic inches should be calculated, and since a cubic foot of cast-iron weighs 450 lbs., the weight of the piece will be found by multiplying its contents by 450 and dividing by 1728. Many estimators simply divide the cubic contents by four and consider the result near enough for all practical purposes.

So much for the materials. Estimating the cost of the labor is not so simple because there is likely to be quite a variety of kinds of units and because it takes about as long to set a heavy piece as one quite a bit smaller. For instance, a bricklayer with a laborer will set a base-plate, sixteen inches square and weighing 100 lbs. in an average time of one-half hour and will take practically the same time for one of half that weight, while a beam bearing plate weighing 40 lbs., should not require over ten minutes.

With masons' time at $1.25 per hour and laborers' time at 60 cts. per hour, the costs would be as follows:

Setting 100 lb. base,	.0083 per lb.
Setting 50 lb. base,	.0165 per lb.
Setting 40 lb. plate,	.0065 per lb.
Average for the three,	.0101 per lb.

It is hardly practicable to set up a table giving the unit times required for all of the different items of cast iron that might be used, but the information just given should enable you to figure the cost as closely as necessity warrants.

The time necessary for setting those items of iron-work that are placed by carpenters and which require boring and lag-bolting can be computed from Table 3, by figuring the time necessary to do all the boring required and adding 1½ times that amount to cover the cost of bolting and assembling.

House Construction

The work of framing and erecting the timber portions of houses and similar buildings is usually a very simple operation, practically the only items involving any complicated work being stairs, bay-windows, roofs and dormers.

Because house-framing is so simple, the most usual method is to compare the building being estimated with some previous job, and then assume a comparative cost per thousand feet board-measure for the new work. This method is usually very satisfactory but sometimes apparently slight variations in the framing will make disproportionately large increases in the cost.

For this reason the same analytical method as outlined by mill-construction should be used to determine the unit-prices which will be used in a house-construction estimate for the framing, using the data in Table 5, while for the erection the data given in Table 6 should be used.

It should be noted that the times given in Table 5 are for spruce, hemlock or other soft wood and they should be increased as follows if hard wood framing timber is used:

For hard pine add	20% to tabular time
For chestnut add	25% to tabular time
For oak add	30% to tabular time

TABLE 5.—House Framing
(Time in Carpenter Hours per 100 Pieces)

Joists		
	Fire-Cutting	Square-Cutting
2x8	16 hrs.	14 hrs.
2x10	18 hrs.	16 hrs.
2x12	24 hrs.	22 hrs.
3x10	25 hrs.	22 hrs.
3x12	30 hrs.	27 hrs.
3x14	35 hrs.	32 hrs.
Rafters		
	Main Rafters	Jack & Cripple Rafters
2x6	14 hrs.	18 hrs.
2x8	16 hrs.	20 hrs.
2x10	18 hrs.	22 hrs.
Wall Studs (Plates same)		
	Cutting Both Ends & Notch for Ribbon	Halving for Splices, add
2x4	10 hrs.	3 hrs.
2x6	12 hrs.	4 hrs.
Partition Studs (Caps & Sills same)		
	Cutting Both Ends	
2x3	7 hrs.	
2x4	8 hrs.	
2x6	9 hrs.	
Main Sills, Halving Only		
4x6	50 hrs.	
6x6	75 hrs.	
6x8	100 hrs.	
Hips and Valleys,	1½ times adjoining rafters	
Bridging,	2 hrs.	

These figures are all for hand-work and do not include the time required for laying out the cuts. If a template is made for each class of members, where there is much repetition, a great saving in time can be made, otherwise an increase of 50% must be made in all of the above times to allow for laying out and measuring.

I have not attempted to give any figures for the use of power-saws as I do not believe they will show any economy on small jobs, and their economy on large jobs is entirely a matter of organizing the work so that the cost of handling the stock to and from the machine does not eat up more than any possible saving which the machine might make.

In using Table 5, note particularly that the cost of framing a stick is really independent of the length of the stick, so the cost of thousand FBM will increase as the length of the pieces decrease. An example of the working out of this point is as follows:

Assuming a carpenters' wage rate of $1.12½ per hr. the cost of framing 2x6 rafters would be:

$26.30 per M for 6 ft. lengths,	(167 pcs. per M)
13.15 per M for 12 ft. lengths,	(84 pcs. per M)
11.34 per M for 14 ft. lengths,	(72 pcs. per M)
9.92 per M for 16 ft. lengths,	(63 pcs. per M)

It can readily be seen that the use of this method eliminates the necessity of guessing how much should be added to the estimate for dormers, bay-windows, and similar features involving a great number of short sticks, since by counting the number of individual pieces required, and figuring the cost on that basis, we have made the necessary allowance in the labor column and need only extend the materials at the proper price into the materials column.

TABLE 6.—Erecting House Framing
(Time in Carpenter Hours per 1,000 FBM.)

Setting Joists on Masonry Wall,	9 hrs.
Setting Joists on Main Sill,	11 hrs.
Setting Joists on Girts or Ribbons,	12 hrs.
Setting Wall Studs, inc. plates,	7 hrs.
Setting 2-storey Partition Studs,	7 hrs.
Setting 1-storey Partition Studs,	11 hrs.
Bridging Joists,	9 hrs.
Bridging Partitions,	9 hrs.
Setting Ceiling Beams,	12 hrs.
Setting Main Rafters,	12 hrs.
Setting Jack and Cripple Rafters,	17 hrs.
Setting Hips and Valleys,	17 hrs.

In most cases it will be practicable to substitute from one-fourth to one-third of laborers' time for the carpenters' time given above, since a great deal of the work consists merely of handling and passing the lumber to the carpenters.

British Columbia Red Cedar Shingles

By A. E. Roberts, Asst. B.C. Lumber Commissioner, Toronto

A report from the Forests Products Laboratories of Canada at Montreal throws some interesting light on red cedar as a non-conductor of heat and cold under the heading "Roofs of Western Red Cedar Saves Coal to Owners of Buildings." The following is an extract from this report. "In heating a building covering large area a great amount of heat is always lost through the roof and a considerable saving of fuel can be effected by making the roof of suitable material.

In this respect of all woods, which are likely to be used Western cedar is probably the most suitable and the best non-conductor of heat. It is obtainable in large quantities and of good quality; it also has a further advantage of possessing a natural resistance to decay even under the most adverse conditions.

The above unbiased opinion pays splendid tribute to red cedar as a roofing material and from a standpoint that has not always been considered.

No roofing material can be praised or condemned from one angle alone. So many points enter into the making of the most satisfactory roof that the architect or builder must base his matured judgment on a selection of the roof which has the greatest number of points in its favor. This entails considerable analysis, but it is a study which every practical student of construction will find interesting and satisfactory; for it is conceded that the choice of a roof is one of the most important problems of building today.

The importance of the right kind of shingle nail should not be overlooked in the making of a permanent roof, for no roof can be stronger than the nail used. It has been estimated that ordinary wire nails last from seven to twelve years in our climate which shows that they are not suitable for even the cheapest kind of dwellings.

Many tests have proved that square cut nails given a zinc coating under hot process of 10 to 12% are probably the best shingle nails manufactured. Such a nail 1¼ inches long has a pulling resistance up to 155 lbs., and with such a coating should last as long as the shingles used.

Should Use Right Kind of Nails

Shingle nail manufacturers are constantly trying to improve their product and some very good galvanized wire nails with wide heads, with thickened shank under are proving up well under test. If a round nail is used it should be ascertained that the galvanizing is done by hot dipped process, and they should be No. 12 gauge. The ordinary No. 14 gauge unprotected wire nail is much too thin and while apparently cheaper at first cost it is probably the most expensive nail in the long run which can be used on a roof. Such nails cannot be recommended for even the cheapest structures. Pure zinc and copper nails are good but their cost prevents them from coming into general use. Summing up it might be said that a hot dipped zinc coated cut nail is the best shingle nail on the market today and should be used on the best work. For speculative and small house contractors a hot dipped zinc or galvanized coated nail with large head and not less than No. 12 gauge will be found reasonably satisfactory. In any case the importance of a good nail should not be overlooked.

British Columbia red cedar shingles are manufactured in XXX, XXXXX, Eurekas, Perfections and Royal grades. The XXX measure 6 butts to 2 inches and are 16 inches long, and should be laid not more thin 4½ inches to the weather in this climate. The XXXXX measure 5 butts to 2 inches, are 16 inches long and are a more satisfactory roofing shingle. Eurekas measure 5 butts to 2 inches, are 18 inches long. Perfections measure 5 butts to 2¼ inches and are 18 inches long. Royals measure 4 butts to 2 inches and are 24 inches long. Royal grade shingles are laid 7½ inches to the weather and architects in Ontario who have used them are more than satisfied with effects produced. The heavy half inch butt casts a depth of shadow most pleasing and distinctive.

The Royal grade shingles from British Columbia have for years found a steady market in the Eastern States where they have been largely used for siding at 11 inches to the weather. In this way they form a warm durable siding unsurpassed for architectural effect.

Red cedar shingles lend themselves readily to the designed mottled roof effect now so much in vogue, and when used in this way are dipped before laying. Any desired color can be used and they can be laid straight, staggered or in wavy lines.

The thatched roof effect so popular in California has spread east and north, and Canadian architects have already produced some tasteful results with red cedar shingles done in this manner. Shingles used in this way are steamed and bent to shape by pressure with permanent results.

Shingles are sold in first and second grades with which architects and builders should familiarize themselves so that they can specify correctly for effect and service desired. Thick butt edge grain shingles are recommended for this climate.

Summarizing, it would appear that red cedar shingles have many points in their favor and that their popularity has been earned by satisfying service covering many years. For just as the Indians of the Pacific Coast cherish the red cedar canoes and Totem poles handed down from their ancesters from generation to generation, even so many a man points with pride today to the red cedar roof his father placed on the old homestead years ago and which is still doing excellent service as a roof covering.

In the end any roofing material must be judged by its durability and the satisfaction it gives over many years. The great building public are building for tomorrow as well as today and in this connection it is well to remember that British Columbia red cedar shingles ceased to be an experiment many years ago.

Important New Buildings in Winnipeg

The Medical Arts Building, the Film Exchange Building and Additions to the Grain Exchange and Great West Life Buildings Are Splendid Contracts Now Being Completed

The Carter-Halls-Aldinger Co., of Winnipeg, carried out a number of important contracts during the past year the more important being the Medical Arts Building, Film Exchange Building, addition to the Great West Life Building and an addition to the Grain Exchange Building.

The Medical Arts Building is a four storey and basement building 100 feet by 120 feet, located at the corner of Graham Avenue and Kennedy Street. It is to be occupied exclusively by doctors and is owned by them. The building is of reinforced concrete skeleton frame construction designed for a future three stories. The exterior walls are of a light colored Tee Pee Moka brick facing with 8 inch back-up tile and with Tyndall stone trim. All interoir partitions are of 3 inch and 4 inch tile. The trim throughout the building is of oak, of sanitary type, and all doors are slab doors with or without glass panels and transom heads depending on the requirements of the different doctors. The floors are maple in the offices, and terrazzo in the corridors. The main entrance is finished in Tyndall stone and ornamental plaster. Stair and elevator enclosures are fireproof.

There are approximately seventy doctors in the building, and each doctor after having his space alloted was permitted to lay out his partitions and fixtures to suit his own requirements; as a result, the layouts vary considerably. In order to accommodate the large number of plumbing fixtures required (these being 150 plumbing fixtures in the building) complete plumbing stacks were run up each interior column and the maple floor kept at sufficient height to permit connections to be run under the floor from the stacks to any location. Compressed air and gas is also available in all offices. Each doctor is supplied with all the light outlets, fixtures, and base plugs required, as well as a separate power service to take care of heavier loads than can be handled on the lighting circuit. The building is also equipped with a separate X-ray service for those who require it. Most of the doctors using X-ray have their offices in the basement, the basement being finished the same as the other floors, with windows 4 ft. 6 in. high. The first floor is 6 ft. above grade.

The building will cost complete approximately $250,000, and will be occupied on March 1, 1923. J. D. Atchison & Company are the architects.

Film Exchange Building

The Film Exchange Building is being erected on the corner of Ellice Avenue and Hargrave Street, Winnipeg, for Mr. M. Chechik. It is 60 feet by 120 feet in plan, five storeys and basement. The basement, first, and second storeys are to be used as a garage, and are connected by a ramp outside the main building. The upper three storeys are to be used as offices for the various film agencies in the city, and the building was erected to comply with the new city regulations covering buildings for film storage. Each office has a vault, with 9 inch brick walls, and fireproof doors for storing the films. The offices have fireproof tile walls with metal windows, doors, trim, and borrowed lights. The floors are of mastic, the vaults are supplied with steel racks for storing the films, entending from each vault through the roof. The building is of skeleton concrete construction, with walls of brick facing, and 8 inch hollow tile facing. The front is finished in dark red matt faced brick and Tyndall stone. The building will cost complete approximately $135,000. Mr. M. Blankstein is the architect.

Great West Life Building Addition

The Great West Life work is a four storey addition to their present four storey building. It is a steel frame skeleton type building, with two-way reinforced concrete floor slabs. The exterior of the

The new Medical Arts Building, Winnipeg

The Film Exchange Building, Winnipeg

building is finished in British Columbia marble, with the exception of the top storey and cornice, which is terra-cotta, to match the marble. The interior is finished in quarter-cut white oak, with maple floors. The addition will cost approximately $300,000. The architects for the addition are J. D. Atchison and Company.

Grain Exchange Addition

The Grain Exchange work consists of a three storey addition to the old portion of the building, bringing the whole building to a finished height of ten storeys. The building is of skeleton type steel frame, with tile arch floors. The only unusual feature of the job was the strengthening of six steel columns from the caissons to the seventh storey. This was necessary due to a change from the original plans in regard to the trading room. The work will cost complete about $300,000. Messrs. Jordan and Over are the architects.

With the Cut Stone Men of Toronto

The International Cut Stone Contractors' Association are holding their annual convention at Hotel Ambassador, Atlantic City, on January 17 and 18. The following delegates from the Toronto District have signified their intention of attending: Messrs. Oakley, Scott, Vokes, Skelly, Hurst, Frank and John Rogers, Isaac and Aitkens.

The Toronto section of the Cut Stone Contractors' Association entertained District No. 4 of the International Association at dinner at the King Edward Hotel, Toronto, on the night of January 5. Following the dinner the district held their annual meeting and the following officers were elected: Mr. J. M. Scott, Governor, and Mr. V. V. Vokes, secretary-treasurer.

Contracts for Edmonton School

In the issue of the "Contract Record" of date October 25 we reported that the contract for the New Eastwood School, Edmonton, had been awarded to J. J. Doyle. We are since advised that the Edmonton Public School Board has revised its decision and awarded the contract to Pheasey & Batson, Limited, general contractors, Edmonton. The contract price is $153,695.

Mussens Ltd. Representing Western Wheeled Scraper Co

Mussens Limited, Montreal and Toronto, have recently taken over the Canadian agency for the line of dump cars made by the Western Wheeled Scraper Company, of Aurora, Ill. This line includes cars ranging in size from 1 yd. 24 inch gauge, to 30 yd., air dump, air brake, standard gauge. The Western Wheeled Scraper Company are said to have produced the first air dump car at the time of the Panama Canal construction and since then equipment of this nature has been used on most of the big engineering jobs throughout the world. In Canada, the C. P. R., contractors on the Welland Ship Canal and many other large construction organizations have made use of Western equipment.

The Professional Engineers of Ontario

The first general meeting of the Association of Professional Engineers of Ontario was held at the Engineers Club, Toronto, on Wednesday evening, January 10 and the following officers were elected: President, Willis Chipman, Toronto; vice-president, Frank R. Ewart, Toronto; together with the following councillors from the various branches:—Civil, Lt.-Col. A. W. Gray, Brockville; Col. H. J. Lamb, Toronto; Mechanical, H. H. Angus, Frederick Burnett; Chemical, D. J. Huither, E. T. Sterne, Brantford; Electrical, S. E. M. Henderson, M. J. McHenry, Walkerville; Mining, J. A. Reid, Cobalt; D. E. Keeley, Schumacher. Mr. R. B. Wolsey remains registrar and secretary-treasurer.

The association now has 478 members, 296 being civil engineers, 38 mechanical engineers, 16 chemical engineers, 90 electrical engineers and 50 mining engineers, while 115 other applications have been received.

Six Tons of Pudlo

The name of Spielman Agencies, Regd., Montreal, was omitted from the list of suppliers of materials appended to the article descriptive of the Montreal Harbor Commissioners' cold storage warehouse in the "Contract Record" of December 27, 1922. As a matter of fact this firm supplied over six tons of Pudlo waterproofing powder for this building.

CONTRACTORS!

The Provincial Builders' and Supply Association of Ontario Will Hold Their Annual Meeting in the Builders' Exchange Rooms, London, Ont., on

JAN. 23, 24, & 25

Some very important matters will be discussed

Will Toronto Builders Have New Home?

At the Annual Meeting of the Exchange the Question of Permanent Headquarters was Discussed and a Scheme of Financing Suggested—Representation of Contractors on Public Boards was Urged

The Toronto Builders Exchange & Construction Industries held their annual meeting on January 9 in the offices of the Exchange at 70 Bond St., Toronto, and discussed many matters of interest to their organization, chief among which, perhaps, was the question of establishing a home for the Exchange. As a result of the discussion on this subject, it now looks as if a definite start has been made on a plan for the establishment of a permanent headquarters. The scheme of financing this undertaking was devised by Mr. T. Britnell and will be discussed in more detail later on in this report.

Mr. W. H. Painter, the retiring chairman, was in the chair and following the reading of the minutes and the usual preliminary business, the reading of several communications, etc., the various officers and committees presented their reports. The chairman's annual report is abstracted as follows:—

"In presenting this report for your approval I beg to draw your attention to the good work started and accomplished by your Board of Directors and various sub-committees. During the past twelve months we have had eleven meetings and at each a good attendance has been recorded. Your different sections have held numerous meetings during the year and good results have been obtained from the work accomplished. The Sheet Metal Association have just made a satisfactory agreement with their union for the period of twelve months at the rate of 80 cents per hour. The Mason and General Contractors' Sections and their respective unions have also signed up for a period of twelve months at the same rate and conditions as prevailed during 1922. With cut stone contractors and master plasterers agreements expire in April, and we trust they will have satisfactory negotiations. The carpenters' unions, failing to agree among themselves, have under those conditions rejected our proposals; therefore, until harmony prevails among them there will hardly be any further proposals from this section.

"We have had a very gratifying increase in our membership, twenty new members having joined our association. Various alterations have been completed in these quarters, and they are as comfortable as we can make them, but as your 1921 president reported 'The Toronto Builders' Exchange should be in quarters of their own' and I would submit that we do not overlook this proposal.

"The construction industry for 1923 bids to be extremely bright. I feel that much construction work of a costly nature will be undertaken this year. Nineteen hundred and twenty two was a lean year for contractors' profits. The lessons of increased prices of labor and materials to carry out our early contracts should not be forgotten too easily. Let us by closer co-operation, and careful estimating make this year 1923 a success for this Exchange, and the craft in general, and with that optimistic feeling that prevails among our members, I wish for its continuance and a prosperous year for 1923."

The financial report, read by the secretary, showed the Exchange to be in excellent financial condition and in the discussion on this subject later, it was decided to continue membership fees on the same basis as last year, that is the assessment for this year will be based on the members' payrolls, furnished by

The Officials who will Guide the Toronto Builders' Exchange for 1923

A. W. Carmichael, President

John V. Gray, 1st Vice-president

W. W. David, 2nd Vice-president

the Workmen's Compensation Board, for the year 1921—1921 figures being used as the basis of assessment for the reason that the Compensation Board cannot furnish the payroll until the spring following the year in which the wages were paid, while fees are compiled in January.

The report of the Nominating Committee, in whose hands the nominations for office in the Exchange are left, brought in the following list, which was unanimously approved by the meeting: President, A. W. Carmichael; vice-president, John V. Gray; second vice-president, W. W. David; board of directors, H. W. Taylor, E. Teagle, C. F. Till, C. Bulley and S. Hurst. Mr. George Gander remains secretary. Mr. Carmichael, in accepting the chair, spoke very briefly, thanking the members for the honor they had shown him in selecting him as president and assured them of his very best efforts on their behalf during 1923.

After a few words by Mr. Gander on the activities of the provincial body, the Provincial Builders' & Supply Association, Mr. John Scott read a letter from Mr. Sam. McBride, the representative of the Exchange on the Canadian National Exhibition Board last year, announcing his willingness to resign this seat to a member of the Exchange. Mr. Scott felt that thanks was due Mr. McBride for his efforts in securing representation for the Exchange on the Exhibition board and proposed the retiring president, Mr. W. H. Painter as the 1923 representative on this board. His motion was seconded by Mr. Skelly and received the unanimous approval of the meeting.

Regulation of Derricks

The following letter will suffice to explain the situation in regard to a proposed by-law to regulate the use of derricks and hoisting equipment. This letter was read by Mr. Vokes, chairman of the Exchange's committee in charge of this matter. It was sent out by the secretary of the Exchange to the members interested, on December 23rd last.

"The city architect's department is trying to frame a by-law that will govern the use of derricks and hoisting apparatus with a view to reducing accidents to workmen.

"At a representative meeting held at the City Hall on December 19, of those interested and also officials of the city architects department it was agreed that we should formulate some plan that would be considered in conjunction with their proposals, and thereby make a draft by-law that would be acceptable to both parties. There will be a meeting to further consider this important work at the Builders' Exchange rooms on January 10. The points to be considered are:

"1. Do you consider it necessary to have permits for the erection of derricks.

"2. The inspection of derricks and hoisting apparatus.

"3. Can derricks be inspected, passed and numbered at the yard so as to be ready for any emergency call?

"4. Would you consider a penalty for using derricks without inspection?

"5. How many derricks, wood or steel, had you in use during 1922?"

The chairman urged the members interested to attend the meeting and formulate a scheme of legislation that would look after the interests of all and yet protect their rights in the matter.

A very pleasant feature of the meeting was the presentation by Mr. Britnell of an honorary certificate of membership to Mr. H. Elgie, one of the oldest members of the Exchange. Following Mr. Elgie's reply of thanks and appreciation, Mr. Britnell advanced his scheme for the establishment of a building fund, referred to previously. This plan had been presented to the members of the mason section of the Exchange, of which Mr. Britnell is the chairman, and had been endorsed by the members of that branch. The proposals contained in this draft scheme as presented to the mason section at a meeting last year, are as follows:

"(1). That the masons section create a special building fund limited to fifty dollars per membership per annum for a period not exceeding five years. First payment to be made at our next regular meeting, subsequent payments to be due and payable during the month of January.

"(2). The executive to act as trustees in charge of this fund and to invest same in Victory Bonds or other similar securities from time to time at best possible rates of interest. No remuneration to be paid for services of trustees.

"(3). No monies to be paid out from fund except upon a two thirds vote of all members present at a special meeting called after proper notice has been given.

"(4). The object of this proposal is to make a beginning towards building or purchasing a suitable property as a home for the building trades and construction industries of this city. Based upon a membership of two hundred, in five years a fund of fifty thousand dollars would be raised plus accruing interest, and which would then warrant our institution in taking up this project. This scheme has in one form or another been talked of for many years. Let us blaze the trail away to a start in the hope that the Board of Directors will endorse the proposition and that all other sections will join in this movement."

This plan received the hearty approval of the members, not a dissenting voice being heard and on suggestion of Mr. J. V. Gray, it was passed on to the new Board of Directors for consideration at their next meeting.

Mr. Bulley at this point proposed a hearty vote of thanks to Mr. C. F. Till for his careful auditing of the accounts of the Exchange during the past year. This proposal was enthusiastically responded to by the members.

Representation on Public Boards

Mr. Harry Jennings, the next speaker, advocated the securing of representation by the Exchange on all public boards, where possible, and expressed his satisfaction at the success of the Exchange in securing permanent representation on the Canadian National Exhibition Board, for which he felt the thanks of the Exchange were due to Mr. Sam McBride's efforts. The matter of representation on the Advisory Council on Technical Education was then discussed and although the exchange so far had been unsuccessful in securing this, some suggestions were offered by the members to the end of getting a representative on this board. It was felt that no consideration would be given by the government to a suggestion to increase the present number of this council, which is twelve, but it was felt that perhaps one of the three members representing the employers on this council might be prevailed upon to step down and make room for a representative from the Exchange, especially in view of the fact that the three employer representatives at present are all manufacturers.

Mr. Jackson was called on by the chairman for a few remarks and he confined these chiefly to the building scheme advanced by Mr. Britnell. He felt that the time was overdue when the association should be established in their own headquarteres and he felt that Mr. Britnell's scheme should be heartily supported by the members as a body and the matter should be no further delayed. He assured the meeting of his personal support towards this ideal.

On the suggestion of one of the members, the meeting was adjourned to the call of the chair, when these matters could be brought up for further discussion, as it was felt that they should be kept alive.

The Building Records of Sixteen Cities

One Hundred and Fifty Million Dollars was the Value of Construction Contracts Awarded in the Fifty-five Leading Cities During 1922—Many Cities Show a Very Decided Expansion

By MacLean Building Reports, Ltd.

Viewing the record of construction contracts awarded in 55 leading cities, the year's total was about one hundred and fifty million dollars, representing a gain of approximately 16 per cent. over 1921. Not all cities of the Dominion contributed in equal proportions to this increase. Indeed conditions in various localities present a most divergent aspect. Taking the sixteen largest cities, however, the statistics reveal decided expansion in seven, a maintenance of the previous year's scale of operations in six, and a rather noticeable shrinkage in the remaining three.

Toronto is an easy leader with contracts awarded to a value of $35,244,278, or nearly fifteen millions more than its nearest rival, Montreal. A year ago Toronto and Montreal were practically on a parity. In the year just ended Toronto alone accounted for over a tenth of the Dominion aggregate.

A year ago it was generally considered that the housing shortage was fairly acute in Toronto. To-day, after a twelvemonth of strenuous home building, that can scarcely be considered the case. As compared with pre-war standards of accommodation some discomfort still prevails, but the trend of rent for residential properties is now downward, and the rent payer, as well as the prospective purchaser or builder of a medium sized dwelling is at last beginning to feel that he can get some value for his money. The market for residential property is backward, if anything. Business rentals are a shade lower, though there is a freer movement of the latter class of property. Conditions in the local labor market are more satisfactory than for many months. Throughout the greater part of the year unemployment has been negligible. Workmen are in a much more settled and willing frame of mind. Building contracts awarded for the last ten years are shown hereunder. In brackets alongside each total is shown the ratio which each year's showing bears to the average for the ten years, which latter is represented by the figure 100:

1913	(150)	$27,038,913	1918	(47)	$ 8,535,331
1914	(115)	20,694,228	1919	(110)	19,819,436
1915	(37)	6,651,889	1920	(143)	25,784,732
1916	(55)	9,881,671	1921	(133)	23,878,240
1917	(40)	7,163,556	1922	(196)	35,244,278

In **Montreal**, which reports a very large total of new building, but not a larger one than in the previous year, the housing shortage is still noticeable. Market conditions for residential property are fair, in spite of a slightly lower tendency in rentals. Business rentals continue very steady. Just as in Toronto there is an adequate supply o fmortgage money available, upon good security, at around 7 per cent. The labor market is as nearly normal as possible. There is a good supply of most classes of building labor, though rather a scarcity in one or two of the more skilled trades. The figures for Montreal are:

1913	(213)	$29,723,452	1918	(35)	$ 4,882,873
1914	(144)	20,022,640	1919	(71)	10,033,901
1915	(59)	8,263,021	1920	(102)	14,358,355
1916	(39)	5,527,544	1921	(152)	21,381,273
1917	(39)	5,501,918	1922	(151)	21,132,586

Vancouver, by virtue of a tremendous advance, has outstripped Winnipeg in the past year, and stands third among cities. But that same improvement in general conditions which has made it possible to undertake building on a much broader scale has also given a keener edge to the demand for bosiness property, and the trend of rentals is, if anything, upward. Residential rents are decidedly firm, there being still comparative shortage of houses, though the need is not so acute as a year ago. Common labor is plentiful, though skilled artisans are rather scarce. The figures are:

1913	(26)	$10,423,197	1918	(36)	$ 1,450,229
1914	(112)	4,484,476	1919	(57)	2,271,411
1915	(40)	1,593,249	1920	(92)	3,709,873
1916	(75)	2,989,893	1921	(76)	3,045,132
1917	(2)	768,255	1922	(217)	8,661,695

Operations in **Winnipeg** expanded moderately during the year. One cannot but look back, however. to the pre-war boom days, when building was three times as heavy as to-day. Here the supply of houses is more adequate for the demand than in any of the larger cities. Empty houses are not uncommon, and there is practically no movement in business property, though rents are not yielding much withal. Mortgage money is available at from 7½ to 8 per cent. on good security.

1913	(29)	$18,621,650	1918	(32)	$ 2,050,650
1914	(207)	12,845,050	1919	(46)	2,948,000
1915	(29)	1,826,300	1920	(131)	8,370,150
1916	(40)	2,507,300	1921	(87)	5,580,400
1917	(35)	2,212,450	1922	(104)	6,875,750

Ottawa is undergoing a little boom of its own, with building double that of the previous year. Present scale of operations is almost equal to that of the liveliest days before the war. In consequence of the very active year in residential building the former housing shortage has considerably abated. The market for both business and residential property is quiet. Labor is abundant at present, except for a few skilled lines.

1913	(138)	$ 3,991,280	1918	(91)	$ 2,635,612
1914	(152)	4,397,820	1919	(111)	3,232,322
1915	(55)	1,605,160	1920	(116)	3,355,662
1916	(53)	1,530,400	1921	(94)	2,716,409
1917	(36)	1,041,017	1922	(173)	5,021,782

Summary of 1922 Construction Activities

Figures Compiled by MacLean Building Reports, Ltd., Show Trend of Building for the Year

Summary of Construction Contracts Awarded in Eastern Canada During Year 1922

	Ontario		Quebec		New Brunswick		Nova Scotia		P. E. Island	
	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value
Apartments	57	$ 1,699,500	39	$ 2,453,500	2	$ 22,000	1	$ 5,000	....	$ ....
Churches	82	2,342,400	52	3,586,100	8	219,500	4	106,000	2	16,000
Factories	141	10,244,600	60	5,497,400	5	431,000	4	380,000	1	8,000
Public Garages	141	1,457,400	219	943,800	3	16,000	14	83,900	1	1,500
Hospitals	19	985,400	9	1,992,000	3	38,000	6	286,000	1	15,000
Hotels and Clubs	51	1,152,900	18	1,250,500	7	218,000	2	13,600	....	....
Office Buildings	69	2,572,500	40	1,792,700	2	22,500	11	287,000	....	....
Public Buildings	53	1,506,900	13	1,687,900	4	47,300	8	86,600	....	....
Residences	11963	59,018,500	4445	23,207,100	306	1,397,800	389	1,720,500	25	114,700
Schools	202	15,180,700	93	7,122,600	11	847,100	15	401,900	3	64,000
Stores	752	9,867,300	209	5,956,100	28	132,000	32	259,000	1	7,000
Theatres	12	754,000	2	64,000	4	105,000	5	40,300	2	30,000
Warehouses	77	3,790,600	42	1,030,000	5	46,500	21	143,000	2	24,000
Total Buildings	13619	$110,572,700	5241	$56,583,700	391	$3,542,700	512	$3,812,800	38	$280,200
Bridges	71	1,416,300	53	872,900	22	271,100	5	15,900	....	....
Dams and Wharves	18	636,400	23	2,146,400	2	189,000	7	85,300	....	....
Sewers & Watermains	141	2,687,000	34	1,001,500	4	78,200	5	221,000	....	....
*Roads and Streets	291	18,794,000	144	8,658,000	8	677,900	31	1,226,000	2	160,000
General Engineering	186	32,521,600	24	34,029,300	7	167,500	14	408,400	1	18,000
Grand Total	14326	$166,628,000	5519	$103,291,800	434	$4,926,400	574	$5,769,400	41	$458,200

Summary of Construction Contracts Awarded in Western Canada During Year 1922

	British Columbia		Alberta		Saskatchewan		Manitoba		Dominion	
	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value
Apartments	12	$ 121,500	1	$ 5,200	1	$ 2,000	2	$ 34,000	115	$ 4,342,700
Churches	16	158,500	20	240,600	7	125,900	13	184,700	204	6,979,700
Factories	37	5,955,500	17	2,991,500	2	26,000	12	221,800	279	25,755,800
Public Garages	34	227,800	15	103,600	11	62,500	23	328,200	461	3,224,700
Hospitals	3	585,100	5	433,700	2	62,400	6	133,500	53	4,528,100
Hotels and Clubs	26	215,000	14	178,100	4	47,000	8	133,500	131	3,211,600
Office Buildings	14	156,700	15	160,000	12	150,900	21	1,113,900	184	6,256,200
Public Buildings	13	105,300	14	108,900	3	65,700	10	57,200	118	3,665,800
Residences	1557	6,052,900	604	1,978,000	569	1,863,700	1196	4,505,600	21054	99,858,800
Schools	66	551,600	74	768,700	69	1,169,800	27	1,157,800	563	27,264,200
Stores	163	1,489,200	76	491,800	50	489,000	94	521,100	1405	19,212,500
Theatres	7	91,000	4	33,000	3	21,000	2	72,000	38	1,189,300
Warehouses	33	390,200	15	231,400	16	133,000	7	43,900	221	5,853,600
Total Buildings	1981	$16,100,300	874	$7,724,500	749	$4,218,900	1421	$8,507,200	24826	$211,343,000
Bridges	16	2,037,900	10	183,000	4	13,000	13	38,100	194	4,848,200
Dams & Wharves	19	4,309,500	....	....	....	....	....	....	69	7,366,600
Sewers & Watermains	16	707,800	8	110,700	4	20,900	18	117,900	230	4,945,000
*Roads and Streets	33	2,338,000	5	138,300	21	602,600	17	584,700	552	33,179,500
General Engineering	27	1,972,800	12	747,000	7	179,000	4	117,900	282	70,161,500
Grand Total	2092	$27,466,300	909	$8,903,500	785	$5,034,400	1473	$9,365,800	26153	$331,842,800

* Total revised to include final returns as to cost of road construction in 1922.

Summary of Contracts Awarded in Eastern Canada for December

	Ontario		Quebec		New Brunswick		Nova Scotia		Eastern Total	
	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value
Apartments	3	$ 125,000	3	$ 147,000	1	$ 10,000	....	$	7	$ 282,000
Churches	2	160,000	4	171,000	1	10,000	....	....	7	341,000
Factories	19	2,289,500	11	197,500	1	10,000	....	....	31	2,497,000
Public Garages	9	143,500	3	63,800	....	....	....	....	12	207,300
Hospitals	....	....	....	....	1	14,000	....	....	1	14,000
Hotels and Clubs	6	113,000	3	34,000	1	10,000	....	....	10	157,000
Office Buildings	5	87,500	6	99,000	....	....	....	....	11	186,500
Public Buildings	3	43,200	....	....	....	....	....	....	3	43,200
Residences	935	4,204,500	424	1,602,900	7	28,500	14	39,600	1380	5,875,500
Schools	10	2,290,500	4	1,175,000	1	55,000	....	....	15	3,520,500
Stores	65	893,500	9	93,000	2	4,500	2	52,000	78	1,013,000
Theatres	2	60,000	....	....	....	....	....	....	2	60,000
Warehouses	4	859,500	4	171,000	1	4,500	....	....	9	1,035,000
Total Buildings	1063	$11,269,700	471	$3,754,200	16	$146,500	16	$ 91,600	1566	$15,262,000
Bridges	1	15,000	7	384,300	....	....	....	....	8	399,300
Dams & Wharves	1	100,000	....	....	....	....	....	....	1	100,000
Sewers & Watermains	19	444,300	3	42,700	....	....	....	....	22	487,000
Roads and Streets	3	85,000	4	118,000	....	....	....	....	7	203,000
General Engineering	2	36,500	4	32,580,000	....	....	....	....	7	32,634,500
Grand Total	1089	$11,950,500	489	$36,879,200	16	$146,500	16	$91,600	1611	$49,085,800

Hamilton, another Ontario city, stands fifth, with practically the same volume of work reported this year as for the last three. Residential rents are slightly easier, while business rentals are inclined to stiffen. There is no very active movement of either type of property. ,

1913	(138)	$ 5,110,000	1918	(67)	$ 2,472,254
1914	(100)	3,703,865	1919	(137)	5,087,462
1915	(41)	1,522,348	1920	(117)	4,340,220
1916	(65)	2,410,131	1921	(125)	4,639,430
1917	(74)	2,746,675	1922	(133)	4,928,465

In **Quebec** also it has been a more active year. There is still a certain shortage of houses. Consequently rentals, both business and residential are steady. It cannot be said that the year has brought about any marked changes in the market, labor, or mortgage money situation.

1913	(77)	$ 1,939,781	1918	(36)	$ 904,375
1914	(110)	2,759,573	1919	(85)	2,134,219
1915	(103)	2,576,342	1920	(92)	2,301,480
1916	(116)	2,912,157	1921	(148)	3,693,397
1917	(98)	2,459,386	1922	(216)	5,397,066

After a year of feverish expansion, building in **Windsor** has quieted slightly, though the 1922 total of contracts is very creditable, and nearly on a par with 1920. Housing accommodation is still scarce, though at this particular season of the year the movement of both residential and business property is rather slow. There is a tendency for skilled laborers to cross to Detroit, following upon the increase in industrial operations in the latter city.

1913	(50)	$ 1,148,975	1918	(25)	$ 570,305
1914	(49)	1,125,413	1919	(113)	2,601,370
1915	(31)	722,870	1920	(211)	4,850,310
1916	(65)	1,508,330	1921	(223)	5,123,130
1917	(48)	1,161,375	1922	(180)	4,144,035

London reports a pronounced shortage of smaller houses. Such dwellings as are on the market are either old-fashioned or too large. Rents are moving gradually up, as the city pursues a steady rate of growth. London came through the last two years of depression probably the least harmed of any Canadian city. It is estimated that eighty per cent. of London working-men own their own homes.

1913	(105)	$ 1,780,920	1918	(52)	$ 877,660
1914	(108)	1,837,735	1919	(144)	2,445,170
1915	(71)	1,207,630	1920	(126).	2,146,305
1916	(55)	926,125	1921	(149)	2,527,510
1917	(49)	837,890	1922	(153)	2,605,630

Edmonton's record comes midway between that of 1921 and 1920, showing an improvement on the former. There is no housing shortage here. Market conditions for all kinds of property are quiet, and rents are nearly stationary.

1913	(385)	$ 9,242,450	1918	(15)	$ 351,470
1914	(230)	5,513,277	1919	(39)	931,346
1915	(13)	309,825	1920	(135)	3,231,955
1916	(10)	231,450	1921	(65)	1,563,696
1917	(13)	309,800	1922	(97)	2,338,109

Calgary conditions are similar to those of Edmonton. There is no housing shortage. Market conditions are quiet, rents stationary to slightly easier, and the labor situation normal.

1913	(359)	$ 8,612,653	1918	(50)	$ 1,196,800
1914	(143)	3,425,350	1919	(92)	2,211,100
1915	(6)	150,550	1920	(117)	2,806,100
1916	(28)	663,500	1921	(96)	2,298,800
1917	(23)	548,200	1922	(129)	3,102,700

Saskatoon has made a very creditable effort. Building contracts awarded for the year just ended were easily the largest since 1913. Moderate priced houses are still in demand, though the shortage is less pronounced than a year ago. Rents are stationary. There is, however, very little movement of business property.

1913	(405)	$ 4,453,845	1918	(55)	$ 604,715
1914	(51)	561,500	1919	(128)	1,404,590
1915	(2)	20,200	1920	(105)	1,150,585
1916	(13)	146,150	1921	(70)	774,660
1917	(53)	582,739	1922	(165)	1,818,090

The situation in **Regina** partakes of the quiet phase characteristic of other prairie cities. Building was less in 1922 than for the previous two years. There are a certain number of empty houses in the city, and rents are tending downward, with business property in very slight demand.

1913	(251)	$ 4,018,350	1918	(63)	$ 1,006,000
1014	(110)	1,761,875	1919	(106)	1,699,020
1915	(29)	464,065	1920	(162)	2,597,920
1916	(14)	222,075	1921	(135)	2,160,030
1917	(26)	416,460	1922	(112)	1,784,124

Halifax is scarcely living up to the promise of 1919, when building was pushed rapidly in the wake of the disaster. The last three years have witnessed a steady decline in building. Rents are easing, and market conditions very quiet. Unemployment is comparatively greater than in most Canadian cities.

1913	(17)	$ 321,198	1918	(151)	$ 2,866,862
1914	(6)	110,973	1919	(273)	5,194,806
1915	(56)	1,063,985	1920	(180)	3,420,539
1916	(64)	1,220,329	1921	(121)	2,192,829
1917	(48)	904,377	1922	(92)	1,752,632

There is no housing shortage in **Victoria.** On the contrary offerings of empty houses, especially large houses, are plentiful. None the less, residential rents are yielding but little, never having been exorbitantly high. Business rentals are steady to higher.

1913	(377)	$ 3,769,555	1918	(29)	$ 289,760
1914	(214)	. 2,143,660	1919	(52)	525,141
1915	(23)	242,450	1920	(121)	1,207,572
1916	(17)	170,265	1921	(98)	977,167
1917	(15)	. 147,879	1922	(103)	1,033,004

In **St. John** there is probably a better demand for residential building than in any maritime city. Building has been light for the last few years, 1922 being no exception. A comparative housing shortage still exists, and rents are firm, with business properties, if anything, a little dearer this year.

1913	(322)	$ 2,412,000	1918	(47)	$ 351,323
1914	(69)	515,300	1919	(68)	506,540
1915	(46)	346,275	1920	(138)	1,035,000
1916	(62)	464,350	1921	(77)	574,500
1917	(71)	531,250	1922	(94)	707,100

Meetings of the Toronto Branch, E.I.C.

The Toronto branch of the Engineering Institute of Canada announces the following meeting for the first half of the winter season:

January 18th—"Railway Valuation" by Arthur Crumpton, Valuation Engineer, Grand Trunk Railway Company, Montreal.

January 25th—"The Giving of Expert Evidence," by His Honor Mr. Justice Riddell.

February 1st—Moving picture film on "The Analysis of Motion by High Speed Photography" and a paper entitled "Some Recent Psychology," both by Professor H. E. T. Haultain of the University of Toronto.

February 8th—"Rainfall and Its Measurement" by Sir R. Frederick Stupart. Director of the Meteorological Service, Toronto.

The B. F. Sturtevant Company of Canada, have a number of interesting and well illustrated catalogues for distribution. These include No. 266 on "Forges and Forge Systems;" No. 281 on "Exhaust Heads;" No. 291 on "Pneumatic Collecting and Conveying Systems;" No. 296 on "Unit Heaters."

Letters to the Editor

Criticizes House Layout

Montreal West, Jan. 8, 1923.

Editor, Contract Record,
Dear Sir:—

As a designer and builder of homes, I have always been interested in your weekly house suggestions, which have appeared from time to time.

For the general good of the cause, I would like to make some constructive criticism on your Suggestion No. 50, (January 3, page 20), but before I go any further, I must admit that it is quite possible that the Architect was tied down to certain features in the lay-out by his client, so that any fault in this respect would not be due to his initiative.

At the first glance at the plans, we note that the dining-room has been omitted, which to my mind is a good feature for houses up to a certain grade, but when the dining-room is omitted there should be, without any doubt, a commodious breakfast or dining alcove—economy in household work demands it. There is ample room for such an alcove, for there is too much lost room along the sidewall from the hall to the back door.

The cupboard in the corner of living-room is entirely out of place, but I presume it was put there to balance the end of room, but why put it there, and thus take up much valuable room, preventing the placing of bookcases and the easy chair there. The vestibule is entirely out of all proportion, unless it is intended to be used as a reception hall; it should be made smaller enabling the living-room to be squared out at this point, and if it is necessary for the front elevation to have a vestibule width equal to the garage, it can be done with a little false work or a small closet could be put at the back of door for rain coats.

The hall stairway is badly arranged, as there is an unwarranted loss of space on both floors—at the very entrance we see only a width 3′ 1″. Had the stairs started near the vestibule door and the upper landing near the bathroom, it would give a much larger Reception Hall on the ground floor, with a coat-room off the hall and not out of vestibule, doing away with the long passage way on the first floor and giving an extra room of 8′ x 10′ over the vestibule.

By placing the kitchen chimney over against the library partition, opportunity would be given for an additional fire-place in the library at a slight additional cost and the corner of the building would be considerably strengthened by the removal of the chimney.

Not knowing the location or contour of the lot, one cannot intelligently criticize the absence of verandahs, placing of windows and garage. The placing of the garage with doors on a line with the front door is, to my way of thinking, objectionable, as the view up and down the street is greatly restricted by the vestibule and garage projections, and further the roof over the front portion of garage extends along and over the living-room window still darkening an already poorly lighted living-room.

For the general welfare of domestic architecture, I would like to see further constructive criticism on this and other plans, as we home builders are always learning, and on the look-out for new and improved layouts and methods in construction.

"ARCHOMBLDR."

Some Ideas on Apprenticeship

Brantford, Ont., Jan. 5, 1923.

Editor, Contract Record:

We have read with a great deal of interest the article on apprenticeship by Mr. J. M. Pigott, in the Contract Record of Dec. 20. We approve of the solution proposed, and of the manner in which he deals with the problem, and agree it is only by concerted, timely action that a curative solution can be obtained.

Because of more thought following the reading of Mr. Pigott's splendid article, may we offer the following:

Mr. Pigott says there is too much education. Is it not true rather that there is too much misdirected education, or education with obscurantism? Probably we master builders ourselves are largely to blame for the fact that the building trades are not being lifted up to-day in our institutions of learning to their proper plane of prominence, as offering to the youth of the land virile, manly and remunerative occupation quite equal in dignity and importance to those seemingly more popular occupations that lead to the wearing of Sunday clothes in working hours.

The far-reaching economical results to be derived by overcoming the trouble are quite sufficient, when properly understood, to demand co-operative government aid, linked with the full support of the employers in the building trades, to the end that a larger percentage of boys coming up through our schools become trained as building artisans.

Would it tend to make apprenticeships more valuable and hence more attractive if the technical school half of the training suggested had to be paid for by those acquiring the knowledge, more after the fashion that prevails with the professions? It is true that we do not appreciate the value so much in those things that we do not have to pay for.

However, no matter who pays, the argument that Mr. Pigott's idea of combined training on the works, with conjunctive school training, is a practical one, is demonstrated in the example of the accomplishment of the Antioch College of U.S.A.

We may say our Company at the present time employs one brick layer and two carpenter and joiner apprentices carried practically throughout the year. While this may compare favorably with most firms to-day, there was a time when as many as twelve men had been apprenticed with us were holding jobs simultaneously as foremen or superintendents in New York City.

We are prepared to stand with Mr. Pigott and others in promptly getting the required results.

Yours very truly,
The Schultz Brothers Co. Limited
A. E. Foulds
Secretary-Treasurer

Mr. Joseph F. Harrison has been appointed advertising manager for the Pittsburgh Des Moines Steel Company, Pittsburgh, Pa., replacing Mr. I. A. Bickelhaupt, who has opened an office of the company in Richmond, Va.

Big Meeting of Clay Products Men at the Royal Connaught Hotel, Hamilton, January 23, 24 & 25

January 23, 24 and 25, 1923, are the dates set for a grand meeting of all interested in any way in the manufacture or sale of clay products, whether tile, brick, hollow ware, pottery, porcelain, firebrick shapes or special lines. This meeting under the auspices of the Canadian National Clay Products Association and the Western Ontario Association will be held at the Royal Connaught Hotel, Hamilton, Ont.

On this occasion the C.N.C.P.A. will celebrate its twenty-first year of activities, while the W.O.C.W.A. which is twenty-five years of age will unite in a joint convention.

Arrangements are being made for papers of interest to all in attendance. A complete list will be sent out in an advance program, but to date the following are assured:

"Simplified Clay Plant Accounts," by Fred Page-Higgins, a well known authority on accounting and intimately acquainted with the clay products business.

"Insurance (Group, Executive, Fire)," by W. May Jr., assistant manager for Western Ontario of the Sun Life Insurance Co. Every clay worker should know how to insure and to what extent.

"Economical Use of Coal," by Mr. McLellan, Penn Canadian Coal Co., Toronto.

"How Building By-laws May Reduce Our National Fire Loss," by A. G. Dalzell. This will deal with the subject from the clay workers' viewpoint.

"Making Soft Mud Brick," by James P. Martin, Lancaster Iron Works, Lancaster, Pa. Many Canadians who are making soft mud brick with Martin machinery will welcome this opportunity to meet Mr. Martin personally.

"Kiln Bracing," by William Burgess, plant manager, Don Valley Brick Works, Todmorden. Clay workers who use rectangular kilns will find a lot of valuable information in this paper.

"New Features of Compensation," by R. B. Morley, secretary of the Industrial Accident Prevention Association. All should be interested in this because it directly affects the annual payment for compensation.

"What Has Been Accomplished with Pyrometers," by B. F. Townsley. In addition to being a salesman and engineer, Mr. Townsley has been brought up in the clay working business and has some new information on pyrometers which we should know.

In addition to the above papers arrangements are being made for one on burning with oil, one on steam shovels, one on ditchers and one on drilling shale. F. L. Ferguson, will, it is expected, give us a paper on tile and Joseph Keele a paper on what he saw in the clay plants of Australia.

Question Box

The question box will be in charge of H. F. Dingledine of Aldershot. Mr. Dingledine is a ceramic engineer with a wide experience. Those who expect to attend are asked to send in questions.

Headquarters

Headquarters during the convention will be the banquet hall of the Royal Connaught Hotel, Hamilton. All business sessions, luncheons and banquet will be held in the banquet hall. Exhibits of clay working equipment and supplies will be held in the same room.

The Program

Tuesday morning—Business session.

Tuesday noon—Luncheon with special speaker.

Tuesday afternoon—Business session.

Tuesday evening—Theatre party, as guests of Hamilton clay workers.

Wednesday morning—Business session.

Wednesday noon—Luncheon with special speaker.

Wednesday afternoon—Visits to plants. These will likely include Canadian Porcelain Co., Campbell's Pottery, National Fire Proofing Co. of Canada Ltd., Hamilton & Toronto Sewer Pipe Co. Ltd., and Canadian Libbey-Owens Glass Plant. Interesting features will be found at all the plants.

Wednesday evening—Annual banquet. The list of speakers will be given in the advance program.

Thursday morning—Business session.

Thursday noon—Luncheon with special speaker.

Thursday afternoon—Business session.

Exhibits

Provision will be made for any member who wishes to exhibit machinery, supplies or the product of any plant.

The Contract Record's

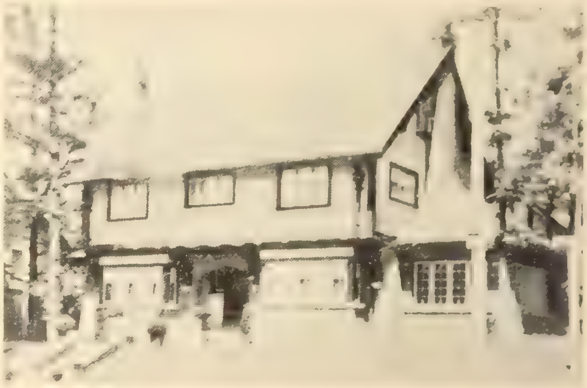
Weekly House Suggestion No. 52

This stone and stucco home has an exceptionally attractive exterior appearance, the well designed front entrance way, with its neat concrete and stone walk leading up to it, being the outstanding feature. All exterior sash is finished in white enamel in keeping with the general clean-cut appearance of the house.

The lower floor and chimney are executed in stone and upper floor in a smooth, white stucco. The roofing is wooden shingles, stained.

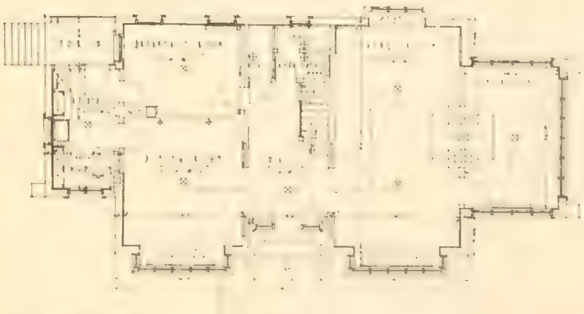
The ground floor layout is ideal in this house, the broad, through hall running the full depth of the house and dividing the space into two approximately equal sections, providing easy accessibility to all rooms yet giving the feature of isolation of the living room from the kitchen and dining quarters. The living room is the outstanding feature of this floor. This is an exceptionally large room, as may be seen on plan, with an entrance on either side of the mantel to the sunroom. There is a built-in window seat at the rear and the ceiling is alcoved over the window at the front. There is an exact duplicate of the living room mantel in the sunroom, these being of tapestry brick construction and forming a single unit as seen in plan, with a common chimney. The dining room and breakfast room occupy the left half of the ground floor plan and each have direct entrance on the kitchenette. The latter, although not large, is so laid out that there is plenty of space after locating stove, refrigerator, cupboards, etc. There is an entrance from porch at the rear. The floors throughout are of quarter cut oak, with the exception of the kitchen, and the trim is finished oak.

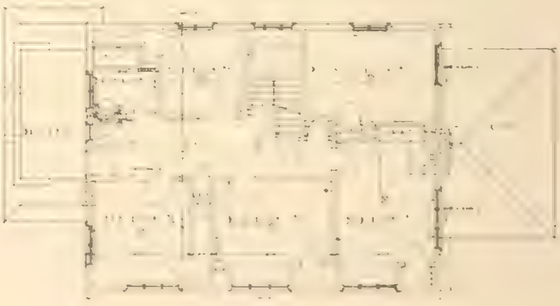
There is a cross hall on the bedroom floor, with five various-sized bed chambers all conveniently located off it. The main bedroom, No. 1, at the front is equipped with a mantel and built-in window seat The flooring throughout this floor is plain oak, with the exception of the bathroom, which is tile. There is an entrance at the end of the hall on a balcony. The bathroom and toilet are separate.



There is a full sized basement, containing hot water heating plant and the usual laundry, coal and storage space.

Mr. H. Addison Johnston, 13 Silver Birch Ave., Toronto, is the designer and builder of this well-planned home.





Mainly Constructional

East and West—From Coast to Coast

The contract for the Longlac "cut-off," a 29-mile link from Longlac, on the Canadian National main line from Toronto to Winnipeg, to Nakina, has been awarded to Foley Bros. & Hervey, railway contractors, it was announced at railway headquarters at Winnipeg recently. This new link will cut down the distance from Toronto to Winnipeg by 103 miles.

Now that the joint filtration scheme has been approved by the ratepayers of the Border cities. detailed plans will be prepared at once, the plans to date being of a very general nature for the purpose of obtaining an idea of the approximate cost. Mr. J. Clark Keith, engineer for the Essex Border Utilities Commission stated that the end of 1924 should see the scheme completed.

The University of Toronto announces an extension course in town planning to be conducted for two weeks February 5th to 17th. Lectures will be given and discussions led by professors of various faculties. A similar course was given last year, and was so successful that a repetition has been decided upon.

The elections in the Building Trades Council at Toronto recently resulted as follows: President John Sutherland; vice-president, John Gillanders; treasurer, Samuel Garland; business agent, William Varley; recording secretary, A. E. Cook.

Enlargement of the present Government grain elevator at Vancouver to approximately twice its present capacity during the coming year was announced by Dr. J. H. King, Federal Minister of Public Works recently at Winnipeg. He stated the capacity of the elevator at present was 1,500,000 bushels of grain.

A recent notice states the Dominion Government is planning to commence work on section eight of the Welland ship canal in the spring. Section 8 will be in the vicinity of Humberstone village and will extend towards St. Catharines. It will be 2 miles long. Winter construction is being carried out on section 3.

The city of Montreal recently voted an additional $1,000,000 for continuing the improvements to the city's aqueduct system. This is the unexpended balance of a $12,000,000 fund for the extension of the city aqueduct system, the construction of the filtration system and the new pumping plant.

Reports from Quebec indicate that the 1923 road program has already been prepared and engineers of the Road Department are arranging with the contractors for the commencement of work as soon as weather conditions permit. It is estimated, in one instance, that of the Quebec-Ste. Anne Road, that construction will be completed early in June, thus allowing use of the highway during practically the entire tourist season.

The program for school construction in Toronto this year, as it stands at the present time before submission to the Property Committee, Finance Committee and the Board, calls for $3,100,000 worth of construction, involving 124 new classrooms in Public schools and 29 in High schools.

The announcement was made recently by officials of the National Steel Car Corporation that it had received an order from the Canadian National Railways for 1,060 new cars, the value of which is estimated at $3,500,000.

The new $250,000 dairy building at Guelph, Ont., was opened recently, Hon. Manning Doherty, Minister of Agriculture, officiating. This building is a step forward in the advancement of the dairy industry in the province, it being considered one of the most modern equipped and finest structures of its kind on the continent.

There is a movement among the conservatives of Toronto towards the construction of a headquarters for the district, at a cost of $75,000, as a memorial remembrance of Sir John A. Macdonald.

The Brotherhood of Carpenters at Toronto recently appointed a committee of Messrs. J. F. Marsh, A Cheeseman and T. Jackson, to take up with the emlpoyers the matter of apprenticeship, in an effort to devise a scheme that would be mutually satisfactory.

The Moloney Electric Company, of St. Louis, Mo., has purchased the tractor building of the Canadian Fairbanks-Morse Company at Toronto, which they propose utilizing for the manufacture of transformers. The company's Windsor plant was destroyed by fire recently, and instead of rebuilding they decided to locate in Toronto.

Personal

Mr. Gordon M. Shanks has resigned as town engineer of Rockwood, Manitoba. Mr. Shanks is joining the staff of the Royal Dutch-Shell Oil Company and will occupy the position of chief draughtsman in charge of design of a large oil refinery extension program for that company at Wood River, Ill.

Mr. Douglas Bremner has been nominated to succeed Mr. K. D. Church as president of the Montreal Builders' Exchange.

Mr. David K. Trotter, secretary of the Montreal Builders Exchange, recently suffered a painful accident when his arm was broken in an automobile collision. Mr. Trotter's car was struck by a street car and he was thrown out, his right arm being fractured in the fall.

Mr. James H. Barber, of Toronto, prominent civil engineer in the employment of the Canadian Pacific Railway Company, was presented recently with an engrossed address, a purse of gold and a handsome case of pipes on the occasion of his retirement from active service, by the officials of the company located at Toronto. Some of the outstanding developments with which Mr. Barber has been connected during his connection with the company are the construction of the Credit Valley Railway, the Ontario and Quebec Railway, the Guelph Junction Railway (all now forming part of the C.P.R.), the Richelieu River bridge, double-tracking St. Lawrence River bridge, Sortin Yard, double tracking Montreal to Farnham, bridge reconstruction Dominion Atlantic Railway, double-track Lachine Canal swing bridge, and grade separation work at North Toronto, and during the last three years he has been Division Engineer of Toronto Terminals.

Obituary

Mr. John Brown, well-known contractor of Montreal, died recently in that city of heart failure. Deceased was 66 years of age and had lived in Canada practically all his life, coming here from Ireland at an early age. Mr. Brown built several railway bridges on the C.P.R. Ottawa-Winnipeg line and of recent years had been engaged in wharve construction along the lower St. Lawrence.

Mr. David Wells, a painting contractor of Toronto, died recently of heart failure while at work on a house painting job in that city. Deceased was 72 years of age.

CONSTRUCTIONAL ACTIVITY

Period of Jan. 10 to Jan. 16, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Campbellton, N. B.
City Council contemplates a subway. P. M. Shannon is the secretary.

Fredericton, N. B.
Additions to the watermains will probably include enlarging of pumping plant, fire mains, etc. J. A. Reid, Mayor.

London, Ont.
City Council will proceed with the construction of $85,000 storm sewer under the direction of H. A. Brazier, City Engineer.

Marieville, Que.
Procincial Government will call for tenders in the spring for roadways costing $30,000.

Montreal, Que.
Metropolitan Commission is having plans prepared for the opening and paving of a 33 mile boulevard at a cost of $2,000,000. S. Fortin, secretary.

Ottawa, Ont.
City Council contemplates spending $225,800 on pavements. Commissioner of Works, A. F. Macallum.

Owen Sound, Ont.
Public Utilities Commission, J. Parker, secretary, contemplate the installation of larger gas mains.

Province of Ontario.
In accordance with the 1923 roadwork program the Provincial Department of Highways wants tenders on concrete pavement, asphaltic concrete pavement, bituminous penetration pavement, macadam base course, grading, macadam roadway and concrete culverts as advertised on page 50, Jan. 10 issue of the Contract Record.

West Kildonan, Man.
Municipality of West Kildonan contemplates sewer extensions.

West Lorne, Ont.
Town Council will proceed with a $5,000 permanent pavement in the spring. Ratepayers passed by-law. Sec.-treas. J. S. Robertson, West Lorne.

Winnipeg, Man.
City Council contemplates extensions to sewers. C. J. Brown, city clerk.

CONTRACTS AWARDED

Montreal, Que.
Departments of Railways and Canals has awarded Sicily Asphaltum Paving Co. Ltd., Montreal, the contract for paving St. Patrick St.

Railroads, Bridges and Wharves

Campbellton, N. B.
Provincial Government, Department of Highways, contemplates an $800,000 bridge. P. J. Veniot, Parliament Buildings, Fredericton, Deputy Minister.

Godbout, Que.
St. Regis Paper Co. of Canada Ltd., Montreal, contemplate a wharf at Godbout. Work will start in the spring.

Longlac, Ont.
Telegraph lines, stations, ballasting, and track laying from Longlac to Nakina will be done by Canadian National Rlys.

Magog, Que.
MacKinnon Steel Co. Ltd., Sherbrooke, Que., has the contract for steel in a $35,985 reinforced concrete bridge at Magog.

Ste. Arsene, Que.
County Council contemplates a steel bridge. Sec. J. W. Roy, engineer, I. E. Vallee, Parliament Buildings, Quebec.

Ste. Julienne De Rawdon, Que.
Reinforced beam bridge contemplated. I. E. Vallee, Parliament Buildings, Que., engineer.

Shellmouth, Man.
Tenders will be received until Jan. 20 by Geo. Hunt, Dropmore, Man., secretary-treasurer of the municipality of Shellmouth, for the construction of two pile bridges.

York Twp., Ont.
W. A. Clarke, Jarvis St., secretary for York Township, has extended the time for receiving competitive plans and estimates on a concrete arch bridge until Jan. 20.

CONTRACTS AWARDED

Longlac, Ont.
Foley Bros., St. Paul, Minn., & C. L. Harvey, Montreal, have the general contract for 29½ miles of railway construction between Longlac & Nakina, Ont., for the Canadian National Railways. H. T. Hazen, Old Union Station, Toronto, chief engineer.

Richibucto, N. B.
Department of Highways has awarded D. M. Le Blanc, of St. Anselme the contract for a $15,000 bridge.

Trent Canal, Ont.
Standard Steel Construction Co., Welland, have the contract for superstructure. J. W. Pugsley, Dominion Government Department of Railways, Ottawa, secretary.

Fred. A. Robertson, Cornwall, Ont., has the general contract for the dredging of the Trent Canal.

Welford Parish, N. B.
D. M. LeBlanc has the general contract for a $32,000 bridge.

Public Buildings, Churches and Schools

Bedford, Que.
A $30,000 convent is contemplated by the Bedford School Board. S. Fortin is the secretary.

Cornwall, Ont.
A High School costing $100,000 is contemplated by the school board. By-law was carried on Jan. 1. R. McG. Nichol, chairman of the Board.

Erin, Ont.
The architect has not yet been appointed for the proposed $10,000 school at Erin, Ont. Dr. Abbott, trustee.

Fredericton, N. B.
Board of Education contemplates a High School costing $300,000. R. D. Hanson, High School Building, secretary.

Granton, Ont.
School Board at Granton contemplates the erection of a continuation school.

Grimsby, Ont.
Town Council wants tenders on installation of a hot water heating system in Fire Hall. No closing date set.

Haileybury, Ont.
Provincial Government, Department of Works, contemplates a jail. H. F. McNaughton, Parliament Buildings, Toronto, secretary.

Hamilton, Ont.
The Erskine Presbyterian Church, Pearl St., contemplates an additnon to the Sunday school at cost of $4,000. Rev. S. B. Russell, 141 Bold St., minister.

Harrow, Ont.
Village Council contemplates the erection of a Town Hall. J. H. Madill, clerk.

Hesson, Ont.
Separate School Board contemplates a $10,000 school. Chairman of the Board, C. Mosher, Jr., Hesson via Millbank.

Lakeview, Ont.
Four room school will be built in east end of Lakeview. Architect not yet appointed. Secretary, Harry Long, Stop 35 Lake Shore Rd.

Lefaivre, Ont.
Tenders will be received until April 1 for $175,000 church of 'St. Thomas D'Alfred. Rev. J. Bedard, priest.

London, Ont.
Plans are to be prepared for the addition of a rest room and a building for the sale of butter and eggs, by the Agricultural Section Chamber of Commerce. W. H. Porter, Farmer's Advocate, secretary.

Montreal, Que.
R. Gariepy, 15 St. James St., has prepared plans for a presbytery for a parish. Tenders will be called for about

the end of this month. Jos. Bidet, 190 St. Maurice St., priest.

Oka, Que.
E. Payette, St. Francois Xavier St., is preparing plans for a rest house at Oka. Tenders will be called for in March.

Orkney, Ont.
School Board contemplates the erection of a school building. Chairman of the board is J. Sharp.

Outremont, Que.
Dominion Government contemplates a Post Office on Outremont St. R. C. Desrochers, Parliament Buildings, Ottawa, secretary.

Protestant School Board contemplates a school this spring. I. W. Burry, McGill St., trustee.

Owen Sound, Ont.
Owen Sound Agricultural Society is contemplating an agricultural hall. E. Bonnell, 2nd Ave. E., secretary.

Quebec, Que.
Tenders will be received by Geo. Morissette, secretary of the Quebec Provincial Exhibition Commission, until Jan. 20 for the Industrial Palace to cost $125,000.

A hospital is contemplated at cost of $500,000 by the Reverend Sisters Hotel Dieu du Precieine Long. Architect not yet appointed.

Tanguay & Chenevert, 20 D'Aiguillon St., are the architects preparing the plans for the rebuilding of the Basilica.

Riversdale, Ont.
Separate School Board will have plans prepared for a school costing $10,000. Secretary, Father Goodrow. Architect not yet commissioned.

St. Boniface, Man.
St. Boniface College will be rebuilt. J. A. Marion, chairman, St. Boniface School Board.

St. Charles, Que.
Church costing $125,000 contemplated. Viau & Venne, 76 St. Gabriel St., Montreal, architects. Priest, Rev. Mr. Larose.

St. Georges, Que.
Convent of Reverend Sisters du Bon Pasteur destroyed at loss of $150.000.

St. George De Beauce, Que.
Good Shepherd Convent destroyed by fire will probably be rebuilt. Loss was $100,000.

St. Henri, Que.
Board contemplates a school. J. A. Fortier, secretary.

St. Hyacinthe, Que.
Soeurs St. Joseph contemplate a $20,000 convent.

$75,000 convent contemplated by Freres Maristes. Viau & Venne, Montreal, architects.

St. Theodore D'Acton, Que.
This parish contemplates the erection of a $15,000 presbytery. J. O. Turgeon, Montreal, architect. Priest, Mr. Moffatt.

Shawinigan Falls, Que.
$275,000 church contemplated. Rev. L. A. L. Dusablon, parish priest. Ludger Lemieux, Montreal, architect.

Terrebonne, Que.
Old Post Office building is being wrecked. New structure to cost $26,000. R. C. Wright, Hunter Building, Ottawa, architect. R. C. Desrochers, Parliament Buildings, Ottawa, secretary.

Toronto, Ont.
Albert Beatty, 10 Tyrell Ave., wants catologues and information re church fixtures, building equipment, etc. Member of St. Clair Ave. Baptist Church Building Committee, which contemplates a $90,000 church and Sunday school.

Methodist Union of Ontario has purchased the site and contemplates the erection of a church. Architect not yet appointed. Supt. Rev. T. W. Neal, 145 Jarvis St.

Valcourt, Que.
$15,000 presbytery contemplated by the parish. Rev. A. Gervais has plans and specifications and is receiving tenders.

Verdun, Que.
Catholic School Commission contemplates the purchase of $30,000 worth of school equipment. Secretary, O. Deguise.

Westmount, Que.
Tenders for Westmount Baptist Church will not be called for before March. S. Comber, Stanley St., architect.

Weston, Ont.
Until Feb. 7 S. B. Coon & Son, architects, will receive bulk tenders for an Industrial and Vocational School at Weston. Cost will be about $115,000.

CONTRACTS AWARDED

Brantford, Ont.
Globe Furniture Co., Brantford, have the seating contract for the $20,000 Baptist Church.

Kingston, Ont.
The roofing contract for the Isolation Hospital has been awarded to McFarlane-Douglas Co. Ltd., Ottawa.

Montreal, Que.
E. Le Page, 990 Parthenais St., has the tiling contract for Montreal University.

Contracts for Sacred Heart Church, costing $292,000 have been awarded as follows: M. Chouchinard, roofing; J A. St. Armour, electrical; O. Caron, plumbing & heating; T. Renaud, painting; M. Lamoureux, arch. iron; J. P. Dupui Ltd., millwork.

Port Credit, Ont.
Roofing and sheet metal contracts for Port Credit school let to W. A. Moffatt & Co., Toronto. R. Bateron, c/o architect has the heating and plumbing contracts.

Rothesay, N. B.
Memorial Chapel & Dining Hall contracts awarded to: Wm. Bovaird, masonry; A. & E. Blake, plumbing & heating; Webb Electric Co., electrical; C. W. Have, glazing & painting; Chapel furnishings not yet purchased.

St. Hyacinthe, Que.
Ornamental iron contract for "Hotel" Dieu" awarded to Architectural Iron Works, Ltd., Montreal.

St. John, N. B.
Murray & Gregory, Douglas Ave., have the millwork contract for alterations to General Hospital. Union Foundry & Machine Works, Union Station, has the steel contract.

Toronto, Ont.
Contracts for the University Administration Building have been awarded to: Archibald & Holmes, masonry, J. C. Scott, carpentry; Canadian Ornamental Iron Co., ornamental iron; A. E. Phillips, painting & glazing; A. D. Grant, plastering.

Business Buildings and Industrial Plants

Bathurst, N. B.
Comeau & Co. will build a $6,500 store. Geo. Eddy Ltd., has the general contract.

Brantford, Ont.
Glen Motors, Toronto, contemplate a 1 storey factory. Architect not yet appointed.

Ford, Ont.
Windsor Construction Co. is excavating for a machine shop and garage for Merlo & Ray, Ford City. Building will cost $15,000.

Godbout, Que.
St. Regis Paper Co. of Canada Ltd., Montreal, contemplates a pulp mill and work will probably go ahead in the spring.

Goderich, Ont.
Goderich Evaporating Co. contemplates a canning factory.

Grand Linge, Que.
Plans are being prepared and tenders will be called for about March for a gymnasium and workshop for the Feller Institute.

Haileybury, Ont.
L. K. Ligget Co. Ltd., Toronto, contemplate a drug store in Haileybury. Architect not yet appointed.

P. H. Jory has a drug store under construction in Haileybury.

Harry Lew Tong is building a restaurant which will cost about $10,000.

R. Gibson is building a business block at cost of $15,000.

Harrow, Ont.
J. H. Madill & Co. are having Thos. Jenner prepare plans for the alteration of a business block.

P. Philpott will build an addition to a bakery and equip it as a retail store.

Kingsville, Ont.
Nicholson Transit Co. has purchased Groverdale Hotel and proposes to remodel it. This company also contemplates dredging the harbor at the west pier.

London, Ont.
S. Mitiges, Richmond St., contemplates a $15,000 addition to his poolroom. S. Stuart Pavey, Sterling Bank Bldg., architect.

Mimico, Ont.
G. T. Rly. contemplates the erection of a large storage shed at cost of $50,000.

Montreal, Que.
T. Prefontaine, St. James St., contemplates 6 garages. P. L. W. Dupre, St. James St., architect. Tenders will be called for in May or June.

Quebec Liquor Commission is build-

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

Tenders for the Construction of the Weston Vocational School, Weston Ontario

General tenders only will be acceptable, and must be on special forms and in sealed envelopes, which will be furnished for this purpose by the Architects.

A deposit of a marked cheque of 2½% of the amount of the contract or a Bid Bond is required with each tender, and when the contract is executed a bond of 50% of the contract will be required.

The building is to be completed by September 1st., 1923.

Tenders must be in the hands of the Architects on February 7th, 1923.

A deposit of $25.00, is required by the Architects to procure plans. In the event of the plans not being returned on the date agreed, the said deposit will be forfeited.

Plans, specifications, Tender Forms and information, may be had at the office of the Architects.

S. B. COON & SON,
4 St. Thomas Street,
Toronto.

Jan. 9, 1923. 2

Toronto Transportation Commission

TENDERS

Sealed tenders will be received for a complete COAL AND ASH HANDLING PLANT," for the proposed General Repair Shops, Bathurst and Davenport Road, Toronto, including two reinforced concrete bins, track hopper, apron feeder, coal crusher, elevator conveyor, flight conveyor, ash elevator, etc. Tenders are to include all the work contemplated.

All tenders are to be endorsed "Tender for Coal and Ash Handling Plant, General Repair Shops," and are to be addressed to the Chairman of the Toronto Transportation Commission, and must be delivered to the offices of the commission, 5th Floor, Public Utilities Building, 35 Yonge St., Toronto, not later than noon on **Monday, January 22nd, 1923.**

Each tender to be on the Commission's Form of Tender and must be accompanied by an accepted bank cheque payable to the Toronto Transportation Commission for 2½% of the amount of the tender.

Plans, Specifications, Form of Tender and instructions to bidders may be had on application to the Commission's Buildings Department, 3rd Floor, Public Utilities Building, 35 Yonge Street, Toronto.

The lowest or any tender not necessarily accepted.

H. H. COUZENS,
General Manager,
3 Toronto Transportation Commission.

Asphalt Plant Wanted

[illegible]

Toronto. 3

RATES

20 cents per agate line (14 lines to the inch) Positions Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

STEEL PILING

1000 tons 40′ long.
14″ x ⅜″ Arch Web.
7″ x ¼″ Straight Web.
All ready to load.
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IDLE EQUIPMENT

What is the depreciation and storage charges on some of your equipment? Perhaps it is pretty heavy when you figure it out. You have, no doubt, some machinery that you cannot use yourself at the present. Some other engineer or contractor will, perhaps, be willing to pay you a high price for such machinery for a rush job. Use the Contract Record Tender and Proposals Department to your advantage the cost is small.

SALE OF BUILDINGS AND SITE

Sealed tenders addressed to the undersigned and endorsed "Tender for the purchase of buildings and site, St. Andrew's College, Toronto, Ont.," will be received at this office until 12 o'clock noon, **Tuesday, January 30, 1923,** for the purchase of the buildings known as and now occupied by St. Andrew's College and the site on which these buildings stand, which property is bounded on the North by Summerhill Avenue and on the East by MacLennan Avenue, on the South by Schofield Avenue and the Toronto Athletic Grounds, and on the west by a ravine and partly by Summerhill Avenue, Toronto.

The party whose tender is accepted must make payment as follows;—25% cash down when offer is accepted and balance in three equal, annual instalments, with interest at six per cent (6%) per annum.

Each tender to be accompanied by an accepted cheque on a chartered bank, equal to 10 per cent of the amount of tender, payable to the order of the Minister of Public Works, which will be forefeited if the person tendering decline to carry out his bid. War Loan Bonds of the Dominion will also be accepted as security, or War Bonds and cheques if required to make up an odd amount.

The Department does not bind itself to accept the highest or any tender.

By Order,

R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, January 13, 1923. 3-4

A Service to the Profession

Every man wishing to tender must first see the plans and specifications.

If the plans are in Montreal and he is in Vancouver the inspection is a problem. We however, with your assistance, are able to solve it. Place them on file at any or all of the offices of the "Contract Record" throughout the Dominion.

Contractors, engineers and allied manufacturers read the "Contract Record" for it is the logical publicity medium for the announcement of tenders wanted.

Send us your plans. They will receive the best of care.

A room is reserved in each of our offices for examination of your plans by possible bidders.

Contract Record and Engineering Review

Toronto - - - 345 Adelaide St., W.
Montreal - - 119 Board of Trade Bldg.
Winnipeg - - - 302 Travellers' Bdg.
Vancouver - - - 106 Winch Bldg.
3-T.f.

Late News

Goderich, Ont.

J. H. Tromanhauser, Adelaide St., Toronto, has the general contract for a wharf at Goderich. Work must be completed by April 1.

General contract for $250,000 grain elevator for the Goderich Elevator & Transit Co. awarded to J. H. Tromanhauser, Toronto.

Haileybury, Ont.

Bert Elliott is interested in forming a company to build a $15,000 theatre.

Hamilton, Ont.

Work has just commenced on a $22,000 factory, Bird & Son, Beach Rd., owners and general contractors. L. O'Dell, manager.

Appleford Co. Ltd., Clyde Block contemplate a factory.

Montreal, Que.

Joint Ownership Construction Co., New York, have options on three sites and contemplate two apartment houses to cost $2,000,000 each. J. D'Arcy, 342 Peel St., Montreal, local representative.

Ottawa, Ont.

City contemplates adding an aerial truck and equipment to the Fire Department at a cost of $35,000 R. Burnett, chief.

Fire station for the west end is contemplated. Cost to be about $30,000. R. Burnett, chief.

City Council will call for tenders for the removal of the spans from Cummings St. bridge.

Watermains and services estimated to cost $125,000 are contemplated by the Ottawa City Council. Commissioner of Works, A. F. Macallum.

ing a warehouse at a cost of $40,000. O. Archambault is the general contractor.

Foundations are in for a $18,000 warehouse for M. G. Valiquette, St. Catherine St. A. Bouchard is the general contractor.

Contracts for roofing, plumbing and heating of 2 residences costing $25,000 have been awarded to J. E. Hardy, 1470 Papineau St., Montreal.

L. G. S. Morin, St James St., contemplates an addition to an office building as soon as Sherbrooke St. is widened. M. Dufresne, 436 Pie IX blvd., engineer.

C. Davis Goodman, architect, St. John St., will call for tenders for refrigeration insulation to be installed in S. Coorsh's store.

McVicar & Heriot, 233 Bleury St., have prepared plans for Caron Bros. for an office building.

Dominion Glass Co. Ltd., Dovercourt Rd., Toronto, contemplate a plant in Montreal. Nothing definitely decided yet.

Ottawa, Ont.

An auditorium is contemplated by the Auditorium of Ottawa, Ltd. Complete artificial ice plant to be installed. Manager, F. D. Burpee, Richards & Abra, architects.

Plans are being prepared and tenders will be called for in March for a $150,000 bakery, for Standeard Bread Co., Westboro, Ont. Sydney Comber, Stanley St., Montreal, architect.

Owen Sound, Ont.

City will grant Patterson & Little a free site for their proposed elevator.

Port Arthur, Ont.

N. Bawlf Grain Co. Ltd., Winnipeg, will call for tenders for the general contract on their terminal elevator about Feb. 1.

Rigaud, Que.

Northern Explosives Ltd., want tenders on a powder storehouse. E. E. Bard is receiving the tenders.

St. Eugene, Ont.

E. Labrosse contemplates a stable and barn. Work will go on in the spring.

St. Hyacinthe, Que.

R. Rene Richer, Girouard St., wants tenders on an office building costing about $12,000.

C. U. S. Knitting Co., will shortly call for tenders for a factory costing $50,000.

Strathroy, Ont.

G. T. Rly. and Strathroy Fruit Growers' Association are discussing the erection of a packing house.

Sulphur Springs, Ont.

Architect has not yet been appointed for the proposed Sanatarium Hotel. Reeve J. Moffatt, Ancaster, Ont., interested.

Toronto, Ont.

K. & S. Tire & Rubber Co. Ltd., Paton Rd., will let the tenders for heating, plumbing, painting, plastering and wiring the $25,000 addition to their factory.

Work will start shortly on a $7,000 store and apartment. G. F. Simth, 354 Logan Ave., owner & builder. No materials purchased.

N. Fegelman, 124 Markham St., has had plans for 3 stores prepared by B. Swartz, Dundas St. W.

Dominion Bank, Toronto, has commenced excavation for a branch in North Toronto. J. M. Lyle, Bloor St. W., architect.

Work is held up on the alteration of a residence into a factory at cost of $20,000. B. Swartz, Dundas St. W., architect.

F. A. Baker, Bank of Hamilton Building, Toronto, is preparing plans for an office building.

A. Carlton, Lambton Mills P. O., is building greenhouse of sash, glass and frame construction.

H. Marx, Lambton Mills, P. O., will commence work shortly on a greenhouse.

Roofing, electrical, plumbing & heating contracts for 24 stores & apartments being constructed by Weismiller & McKenzie, not yet let.

The electrical contract for a $20,000 store has been awarded to Ringling Bros., Dundas St. W., Loblaw Groceteria Co., owners.

Victoria, B. C.

B. C. Telephone Co., Victoria, B. C., contemplates a new office building.

Welland, Ont.

Welland Cotton Mills will commence work shortly on new mill. Diffin Construction Co., Main St. Welland, will probably be the general contractors.

Windsor, Ont.

Industrial Lock Nut Co. of Canada have purchased the site and propose to erect a factory in the spring.

CONTRACTS AWARDED

Hamilton, Ont.

Plumbing contract for the Zimmerman Reliance factory awarded Robert Fitzimmons Ltd.; roofing, heating and fire doors let to G. & J. Inrig, Locke St.

H. Barnes, 310 Ottawa St., has the plumbing contract for a $12,000 factory.

Moncton, N. B.

Ambrose Wheeler, Ralph St., has the contract for rebuilding a store for H. C. Main.

Montreal, Que.

A. Lafrance, general contractor, has let the following contracts for 2 stores and flats costing $25,000: Plastering, A. Brisebois, 112 Dumas St.; painting, A. Raymond & Co., 83 Lasalle Rd.; sash and doors, J. P. Dupis, 592 Church St.; brickwork, J. Beaudet, Ville Emard.

Tiling contract for $25,000 dental building awarded to E. Le Page, Parthenais St.

Almy's. Ltd., St. Catherine St., have commenced work on a new elevator. Cote Bros. & Burrit, have the general contract.

Art. Leduc, Christo Colombe St., has the general contract for a bakery and will do the roofing. Electrical contract awarded to A. Lafond, Laval St.

S. Berthiaume, Alma St., has the contract for sash for a $10,000 store and residence. Tenders on brick and heating wanted.

Contracts on $1,000,000 office building awarded as follows: Weather strip, Dominion Metal & Weather Strip Co.; painting, E. Mapes; store fronts, J. A. Gendron; tile, Interlocking Tile Co. Ltd., Toronto.

Port Arthur, Ont.

Thunder Bay Harbor & Improvement Co. Ltd. has the contract for trestle work and foundations for the grain elevator being built by J. Stewart Co., Winnipeg.

Toronto, Ont.

The general contract for the Ford Assembly plant on Danforth Ave., will be awarded to Anglin Norcross Ltd., Temple Building, Toronto.

Royal Bank of Canada has awarded the Dickie Construction Co., Toronto, the contract for alterations to Yonge & Bloor St. branch at a cost of $25,000. This company also has the contract for altering a store at Queen & Broadview into a branch bank. The cost will run about $25,000.

S. Robertson, 225 Clendennan Ave., has the masonry contract for Howard Furnace Co's. $24,000 factory. In previous report roofing should have read masonry.

The following contracts for an additional storey to National Brass & Aluminum Co's. factory have been awarded by the architects, Kaplan & Sprachman: Carpentry and masonry, A. Greenspan, Clinton St.; structural steel, Hepburn & Disher, Van Horne St.; steel sash, Canadian Metal Window & Steel Products. Balance of trades to be let later.

Hepburn & Disher, Van Horne St., have the contract for steel in the Howard Furnace Co's. $24,000 factory.

Contracts for N. Fegelman's five stores and apartments have been awarded as follows: Plumbing, Duffort Bros.; roofing & heating, A. Swartz; Otis & Co., painting.

The following contracts have been let for two stores and apartments being built by Dr. W. L. Bond, 2317 Yonge St.: Plumbing & heating, Geo. Moore, 3215 Yonge St.; plastering, J. Devlin, 831 St. Clarens Ave.; roofing, St. Clair Roofing Co., 1036 St. Clair Ave. Buildings will cost $15,000.

Hobbs Mfg. Co., Liberty St., have the contract for plate glass for 6 stores and apartments being built by Grimshaw Bros.

Interlocking Tile Co. has the contract for hollow tile in the addition to the Farmer's Dairy. W. A. Moffatt, floors; Geo. Booth, painting.

The following contracts for A. H. Wagstaffe's factory have been awarded: Electrical, G. A. Newman, Toronto; plumbing, J. T. Herriott, Toronto; heating by day labor.

Contracts for the Dominion Bank, Eglinton, let as follows: Roofing, G. Duthie & Sons Dufferin St.; electrical, Douglas Bros., Yonge St.; plastering, A. Petrie, Roxton Rd.; painting, A. R. Robinson, Farnham Ave.

Windsor, Ont.

Walker-Linden & Co., 116 Chatham St., have been awarded the general contract for $37,000 wash house and storage, for the British American Brewery, Sandwich. S. A. Muller, 106 Janette Ave., architect.

Malcolm McGregor, Detroit, Mich., is rebuilding a $23,000 business block. The following contracts have been let: General contract, John V. Gray Construction Co.; structural steel, Canadian Bridge

Residences

Alfred, Ont.
Oscar Vallee contemplates a residence, garage and shed at an approximate cost of $9,000.

Hamilton, Ont.
Charles Salmon, Ottawa St. S., is having plans prepared for three residences costing $25,000.

K. C. Beckett, Charlton Ave. W., contemplates a residence.

G. T. Evans, Hamilton, is preparing sketch plans for one residence to cost $14,000 and another at $12,000.

Peter Stirling is contemplating the erection of residences.

Kitchener, Ont.
Stanley Shupe, Queen St. S., is having plans prepared for a residence costing $9,000. W. H. E. Schmalz, architect.

London, Ont.
H. Wolfe, 491 King St., contemplates two residences costing about $10,000.

G. A. Nichols, Wortley St., will have plans prepared for three residences to cost about $12,000.

S. Stuart Pavey, Sterling Bank Building, will prepare plans for a $18,000 residence for W. H. Robinson, Dominion Savings Building, London.

G. A. Nichols, 167 Wortley Rd., contemplates a $5,000 residence.

LondonTwp., Ont.
Chas. White, 514 Dundas St., London, is having plans prepared for a $20,000 residence. W. G. Murray, Dominion Savings Building, London, architect.

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W R Kirkpatrick
Canadian Secretary

UNITED STATES FIDELITY & GUARANTY COMPANY

Longueuil, Que.
Metropolitan Housing Commission will probably call for tenders about Jan. 18 for 2 houses and 8 flats, part of the 24 proposed at cost of $100,000.

Montreal, Que.
J. F. Mackle, owner and builder, Regent Ave., contemplates 10 residences in the spring.

Mutual Construction Co., 212 McGill St., contemplates the erection of an apartment house.

Plympton, Ont.
Fred. Taylor, Forest, Ont., is having plans prepared for a $7,000 residence.

Quebec, Que.
E. Lemay, McMahon St., is building 4 houses costing $18,000.

Work will commence shortly on 33 residences at cost of about $145,200. Les Habatations Limoilou, owners.

St. Catharines, Ont.
A. K. Wismer, Taylor Ave., contemplates three residences.

St. Lambert, Que.
Tenders are expected to be called on Jan. 18 for two houses and eight flats, part of the $100,000 building program planned by the Metropolitan Housing Co., St. James St., Montreal.

South Vancouver, B. C.
Two residences costing $4,000 each are contemplated by E. A. Masters, 4843 Nanaimo Rd., South Vancouver.

Stratford, Ont.
Plans are being prepared by J. Russell, Downie St., for a residence for H. Weber, McNab St.

Thorndale, Ont.
Wesley Logan will commence work in the spring on a residence costing $4,000.

Toronto, Ont.
J. & J. C. Wilson, Glebemount Ave., will shortly commence residences costing $7,000.

Two pair of residences costing $7,000 each are contemplated by A. Yeo, Copeland Ave.

Fred. Aldcroft, Corby Ave., will commence a pair of residences in the spring at cost of $7,000.

A. W. Eade, 11 Cassels Ave., will build a pair of residences in the spring costing $7,000.

Two or three residences, costing $4,500 are contemplated by F. G. Smart, 122 Bingham Ave.

A. W. Carter, Durie St., contemplates a residence costing $6,500.

Five residences are contemplated by A. L. Sanagan, 3 St. Leonards Ave.

Work will commence early in the spring on an apartment house costing $50,000. Frank Britton, High Park Ave., owner. F. K. Hyslop, Sparkhall Ave., architect.

J. Kritzer, 59 Keystone Ave., has excavated for 4 pairs of residences costing $6,000 a pair.

F. E. Brown & Son, Watford Ave., will call for tenders shortly for small trades on $9,000 residence.

Sir Thomas White, Queen's Park, contemplates an addition to his residence. G. W. Gouinlock, Yonge St., architect.

Godson Home Building Co., Armadale Ave., contemplate the erection of a duplex house. Site has been purchased.

This spring Grimshaw Bros. will build 2 bungalows costing $10,000 each.

Tenders are wanted by Caster & Kaake, 2002 Queen St. E., on 6 pair of residences costing $6,000 a pair, for plastering, wiring, painting, heating and plumbing.

Fred. A. Smith, Balsam Ave., will let all trades on an $8,000 residence. No material purchased.

Dr. J. A. Gallagher, Gerrard St. E., is excavating for 9 residences costing $7,000 each.

E. G. Wilson, 42 Langley Ave., is preparing plans for 2 residences costing $15,000. Work will go ahead in the spring and architect will call for tenders on all trades.

Vancouver, B. C.
J. Slingerland, 21st Ave. E., will commence work shortly on a $5,000 residence.

Fred. P. Rogers, 3633 Knight Rd., contemplates a residence costing $10,000.

Verdun, Que.
Tenders for flats costing $60,000 will be received by P. Beique, architect, St. Francois Xavier St., until Jan. 22.

Winnipeg, Man.
P. McDairmid, 160 Vaughan St., is commencing work shortly on a $6,000 residence.

CONTRACTS AWARDED

Montreal, Que.
Vezina & Bugal, Chambord St., have let the following contracts on 9 flats: Roofing, Canada Roofing & Paving Co. Ltd.; electrical, R. Chamberland, Garnier Ave.; plumbing and heating, E. Beau-

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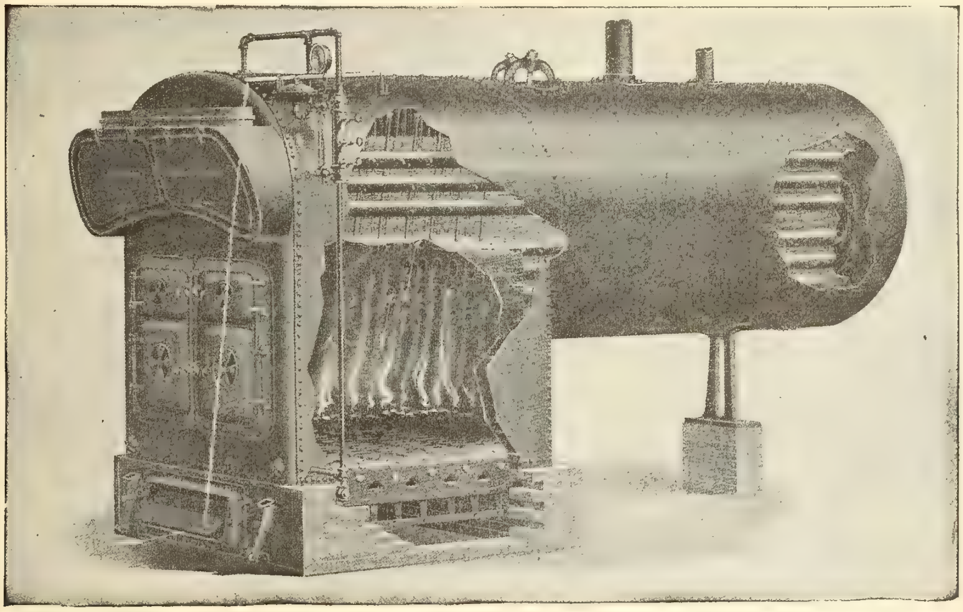

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of Canada, Ltd.
MONTREAL GALT TORONTO

champ, 10th Ave.; plastering, Hammel, Point Aux Trembles; interior trim, J. P. Abel-Fortin & Co., Montreal.

The following contracts have been let for a $15,000 residence being built for E. T. Kingsmill: Roofing, Campbell Gilday Co. Ltd.; plumbing and heating, J. A. Gordon, St. Antoine St.; plastering, T. Bibeau, Chambord St.; tiling, Brown & Sons, Victoria Sq.

Contract for sash and doors for two residences costing $14,000 awarded to Jos. Trudeau, Varennes, Que.

J. E. Prefontaine, Dorion St., has let the following contracts on a $17,000 residence: Roofing, J. E. Moyer; electrical, R. Chamberland; plumbing and heating, J. A. O. Laroche; plastering, C. Poirier; painting, J. S. Sicotte; sash and door, Benoit & Mathieu.

For residences costing $30,000, J. B. Rochon, Decelles St., has awarded contracts as follows: Brickwork, A. Boudette; electrical, J. Gosselin; plumbing and heating, E. Tremblay; other work day labor.

Toronto, Ont.

J. D. Longbottom, 315 Kingswood Ave., has let the following contracts for 2 residences costing $7,000 each: Electrical, Smart & Walsh, Bingham Ave.; plumbing, Duffort Bros., 862 Kingston Rd.; heating, Rumley & Thompson, 463 Woodbine Ave.; plastering, Harry Hill, 16 Lawlor Ave.; painting, Lusted Bros.

For a pair of residences costing $7,000 A. W. Eade, 11 Cassels Ave., has awarded the following contracts: Electrical, H. Hawkins, Silverbirch Ave.; plumbing, F. O. Swann, Gerrard St. E.; plastering, G. T. Pritchard, Dawes Rd.; painting by day labor.

Contracts for 2 residences costing $4,500 each have been let by F. G. Smart, 122 Bingham Ave., as follows: Electrical, Smart & Walsh, 130 Bingham Ave.; plumbing, J. Emmitt; heating, Rumley & Thompson; plastering, J. White; painting, A. Mahoney.

L. Reed, Keewatin Ave., has awarded the following contracts for work on his $5,500 bungalow: Electrical, E. Warman, Soudan Ave.; plumbing, T. E. Boone, Keewatin Ave.; heating, A. H. Power Furnace Co., Hayden St.

Verdun, Que.

General contract for $17,000 residence for Madame D. L. Rey, Cherrier St., Montreal, awarded to J. Coucisse, Wellington St., Verdun.

Power Plants Electricity and Telephones

Adelaide, Ont.

Adelaide Telephone Co., M. C. Morgan, Adelaide via Strathroy, Ont., interested in prices of telephone equipment for repairs and improvements.

Grand Falls, Ont.

New Brunswick Power Commission, St. John, N. B., contemplates further hydro power development. A. R. Carter, secretary. C. O. Foss, chief engineer.

Korah Twp., Ont.

An extension to the electric line is contemplated by the Township Council. J. A. McQueen is the reeve.

·BULLETIN·№ 6·

·BURLINGTON STEEL·Co.·LTD.·

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THE · SPECIFICATION ·

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THE STRONGEST REINFORCING BAR ON THE MARKET, THE MOST ECONOMICAL STEEL BAR ON THE MARKET, THE BAR WHICH DEMANDS LEAST TONNAGE, THE BAR WHICH DEMANDS LEAST CONCRETE, WITH A METAL SUBJECTED TO A DEFINITE DISCARD IN ORIGINAL MANUFACTURE WITH A METAL SUBJECTED TO THE MOST CRITICAL INSPECTION BOTH CHEMICALLY AND PHYSICALLY IN ORIGINAL MANUFACTURE, WITH A METAL SUBJECTED TO THE MAXIMUM AMOUNT OF "WORK" IN MANUFACTURE, WITH A METAL WHICH GOES THROUGH A DOUBLE ANNEALING PROCESS IN SECONDARY MANUFACTURE, WHICH IS FREE FROM ALL INTERNAL STRESS WHEN DELIVERED AT THE BUILDING, WHICH AUTOMATICALLY PREVENTS INTERNAL STRESSES OR PERMANENT STRAINS DURING CONSTRUCTION, WHICH WILL WITHSTAND THE MOST ABNORMAL SHOCKS AND VIBRATIONS WHEN EMBEDDED IN CONCRETE, WHICH IS SUPERIOR IN EVERY PARTICULAR, CLEANER AND PURER, STRONGER AND MORE ECONOMICAL THAN ANY OTHER BAR,

THEN ALL YOU REQUIRE TO SAY IN YOUR SPECIFICATIONS IS:—

"CONFORMING TO THE REQUIREMENTS OF THE A.S.T.M. SPECIFICATION A16-14."

THE AMERICAN SOCIETY FOR TESTING MATERIALS IN 1913, AFTER SIX MONTHS MOST EXHAUSTIVE RESEARCH, WROTE THE FOLLOWING STANDARD SPECIFICATION, GIVING IT THE SERIAL DESIGNATION A16-14.

RAIL—STEEL CONCRETE REINFORCEMENT BARS

SERIAL DESIGNATION A16-14.

4 (a)—THE BARS SHALL CONFORM TO THE FOLLOWING MINIMUM REQUIREMENTS AS TO TENSILE PROPERTIES:

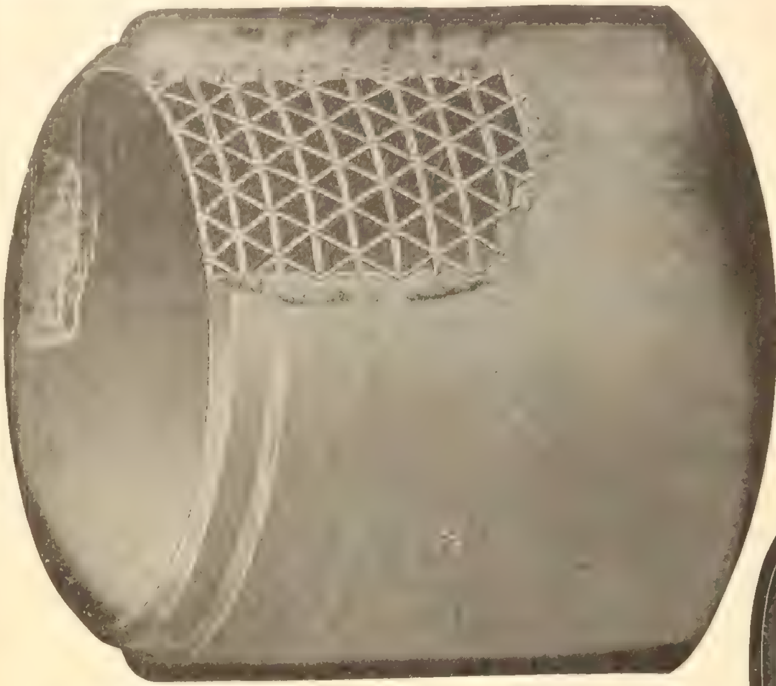
PROPERTIES CONSIDERED	PLAIN BARS	DEFORMED & HOT TWISTED BARS.
Tensile strength, lb. per sq. in.	80,000	80,000
Yield point, lb. per sq. in.	50,000	50,000
Elongation in 8 in., per cent.	1,200,000 / Tens. str.	1,000,000 / Tens. str.

6—THE TEST SPECIMEN SHALL BEND COLD AROUND A PIN WITHOUT CRACKING ON THE OUTSIDE OF THE BENT PORTION AS FOLLOWS:

THICKNESS OR DIAMETER OF BARS	PLAIN BARS	DEFORMED & HOT TWISTED BARS
Under 3/4 in.	180 deg d = 3t	180 deg d = 4t
3/4 in. or over	90 deg d = 3t	90 deg d = 4t

NOTE:- d = The diameter of pin about which the specimen is bent.
t = The thickness or diameter of specimen.

LET US SEND YOU A COPY OF THE COMPLETE SPECIFICATION.



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THE ENGINE of REFINEMENT
For the finest boats that float

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No standby expense.

Costs $20.00 per H.P.

Generates electricity at about .035 per Kilowatt hour.

Pumps water at .03 per B.H.P. hour.

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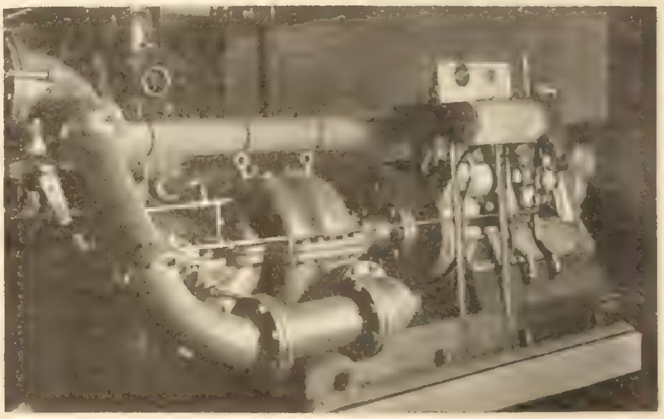

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Sterling Engine Co. Department C. 9 Buffalo, N. Y.

40 to 300 H.P. at 1200—1500 R. P. M.

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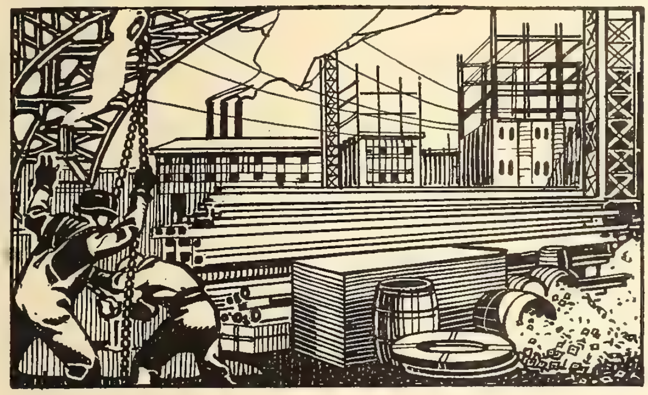

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UNUSUALLY complete equipment and an experienced organization have won for us an enviable reputation for service. Orders large and small receive our prompt attention, and delivery is made **on time.**

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1—HOISTING ENGINE 6½ x 8, D.C.D.D. with swinger and A frame derrick mounted on standard gauge car.
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3—miles 16 lb. Relaying Rail.
5—miles 30 lb. Relaying Rail.
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We design, fabricate and erect various types of structural steel highway bridges. Quick shipments and experienced erection crews are some added features of DES MOINES service.

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CANADIAN DES MOINES

Current Prices of Building and Engineering Materials

CEMENT (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Retail lots including bags	per bbl.	$4.60	$4.40	$4.80	$3.70
Car lots, including bags	per bbl.	3.60	3.68	4.16	3.35
Refund on bags	each	.20	.20	.20	

LIME (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Lump, in retail lots	per ton	14.30	14.00	.58 bu.	2.70 bbl
Lump, in car lots	per ton	12.70**	11.00	13.80 ton*	2.60 bbl
Hydrated, in retail lots	per ton	20.00	26.00	.60 bag*	30.00
Hydrated, in car lots	per ton	19.00	21.00	.54 bag*†	25.00

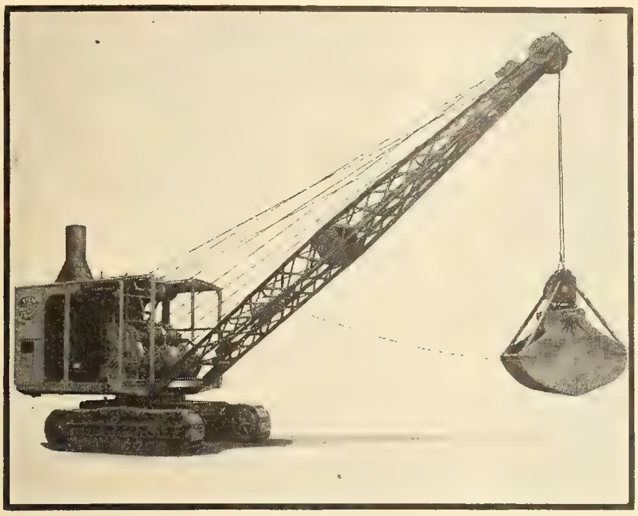
BRICK and TILE (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Common face brick	per M.	24.00	16.00*	19.00	30.00
No. 1 dry pressed brick	per M.	31.00	30.00	36.00	70.00
No. 2 dry pressed brick	per M.	29.00	25.00	32.00	
Enamelled brick	per M.	125 up to	230.00	185.00	150.00
Wire cut brick, for foundation work	per M.	21.00	19.00		50.00
Sand lime brick	per M.	17.00		18.00	
Hollow building tile	per M.			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	60-95	60-75	85-100	80.00
Fire clay	per ton	13-20	15-16.00	35.00**	22.00

STONE, SAND and GRAVEL (f.o.b. cars on siding):—		Toronto	Montreal	Winnipeg	Vancouver
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.00 yd.
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 “	“ “
Crusher run	per ton	2.20½		3.00 “	“ “
Rubble stone	per ton	2.45	1.70	15.00 cord	“ “
Gravel, 2 in. screened	per ton	2.05		2.45 yd.	“ “
Gravel 1 in. screened	per ton	2.31	1.50	2.75 “	“ “
Sand, screened	per ton	1.42½	1.25	1.90 “	“ “
Pit run	per ton	1.52¾	1.25	1.90 “	“ “

STEEL and IRON (f.o.b. warehouse):—		Toronto	Montreal	Winnipeg	Vancouver
Mild steel bars, ¼ in. and heavier	per 100 lbs.	3.25 base	3.25 base	4.35	$4.00
Bands 3/16 in. and lighter	per 100 lbs.	3.75 “	3.25 “	4.85 base	
Hoops	per 100 lbs.	4.50 “	4.25 “		
Twisted and deformed bars	per 100 lbs.	3.35 “	3.25 “	4.20	4.00
Angles, channels and tees under 3 in.	per 100 lbs.	3.35 “	3.75 “	4.95	6.00
Structural shapes	per 100 lbs.	3.60 “	3.75 “	4.75	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.25 “	3.50 “	4.75	6.25
Plates—3/16 in.	per 100 lbs.	3.60 “	3.85 “	5.15	6.50
Plates—10 gauge	per 100 lbs.	4.15 “	4.00 “	5.45	6.50
Black sheets—28 gauge	per 100 lbs.	5.00 “	4.50 “	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.20 “	6.00 “	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	6.20 “	6.50 “	7.70	8.25-8.50
Rivets	per 100 lbs.	5.75 “	5.50 “	7.00 base	
Cast iron pipe	per ton	60.00	55.00		

VITRIFIED CLAY PRODUCTS (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Sewer pipe, 4 in.	per ft.	.40	.30	.35	.28
Sewer pipe, 6 in	per ft.	.60	.45	.45	.48
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.55
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.70
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.85
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00	.90	.65	.75
Chimney tops	each	9.00	3.50–5.00	7.50	4.50–6.00
Discounts		45 % truck lots 50 % car lots	20 % 50 %	5 %	

CEMENT —*Discount of 10 cts per bbl in 20 days. Price f.o.b. cars is $8.75 †Subject to 5% discount. **Excluding bags.
LIME:—*Discount of 5%. †Bag of 50 lbs. **Price f.o.b. cars is $11.70.
BRICK AND TILE—*f.o.b. plant.
STONE SAND AND GRAVEL:—*Winnipeg prices subject to 5% disco **Toronto prices include sales tax.



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Lumber (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver*
Flooring, 1 x 3 and 4 in., clear, E. G. fir	per M.	100.00	60.00	84.00	55.00
Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	75.00	65.00	56.00	30.00
Flooring, No. 1 pine	per M.	70.00	80.00	64.80	
Flooring, No. 1 Spruce	per M.	45.00	40.00	39.60	
Flooring, birch and maple, 13/16 in. clear	per M.	130.00	110.00	152.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	130.00	125.00	140.00	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	75.00	60.00	56.00	30.00
V joint, No. 1 pine	per M.	70.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	43–58	45.00	63.75	
Pine, 2 x 4 to 12 in., common rough	per M.	50/55	70.00	36.00	
Hemlock, 2 x 4 to 12 in.	per M.	40-42.00	40.00	36.00	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	40–50.00	50.00	36.00	11.00-13.50
Spruce, 1 and 2 x 4 to 12 in.	per M.	41/46	45–35	36.00	
Timbers, fir, 10 x 10 in. and up	per M.	65.00	58.00	47.00 base	17.-22.00
Lath, No. 1 white pine	per M.	14.00	12.00	12.00	
Lath, M. R. spruce	per M.	10.00	8.50	10.00	7.00
Shingles, XXX B.C. cedar	per M.	6.35	5.00	5.25	3.40
XX B.C. cedar	per M.	5.00	4.25	3.75	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	108.00	55.00
Fir casing	per M.	1 ct. per in.	100.00	108.00	
PAINTS, OILS, COLOURS (delivered):—					
White lead ground in oil, less than ton lots	per cwt.	14.55	13.35	14.85	15.80
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	22.00
Putty in bulk	per cwt.	6.70	3.75	5.50	9.25
Steel sash putty in bulk	per cwt.	7.20	6.00	8.75	7.75
Boiled linseed oil, in bbls.	per gal.	1.15	1.04	1.13	1.28
Raw linseed oil, in bbls.	per gal.	1.18	1.02	1.10	1.25
Turpentine, in bbls.	per gal.	2.25	1.95	2.15	1.60
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 4/5	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 1/5	.45
PLASTER (Delivered):—					
Hard wall plaster, sanded	per ton	13.50	15.00	25.00	30.00
Plaster of paris, in bbl. lots	per bbl.	6.00	5.35	1.60 bag*	7.50
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu.	1.50
LABOR:—					
Bricklayers	per hr.	1.00	.80–.90	1.15	1.06¼
Structural Iron Workers	per hr.	.85	.50–.75	1.25	1.00
Plasterers	per hr.	1.00	.80	1.05	1.06¼
Hoisting Engineers	per hr.	.70–.80	.50	.90–1.10	1.00
Plumbers	per hr.	.90	.60–.75	1.00	.90
Carpenters	per hr.	.80	.65	.90	.81¼
Painters	per hr.	.75	.55–.65	.80	.81¼
Electrical Workers	per hr.	.80	.65	.70– .90	1.00
Roofers	per hr.	.65	.65		.90
Laborers	per hr.	.40–.50	.30	47½–.55	.50–.56¼
Sheet Metal Workers	per hr.	.75			.90

LUMBER:—*Owing to the general unstable condition of the present lumber market, Vancouver dealers refuse to quote any prices at all especially for Prairie or Eastern publication. The prices are, moreover, fluctuating from day to day. Such prices as we quote are, therefore, averages and not standard.

PLASTER *Including bags.

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Rapid Truck Delivery. Just Phone
Beach 1128 or 1780

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STOP 19, KINGSTON ROAD
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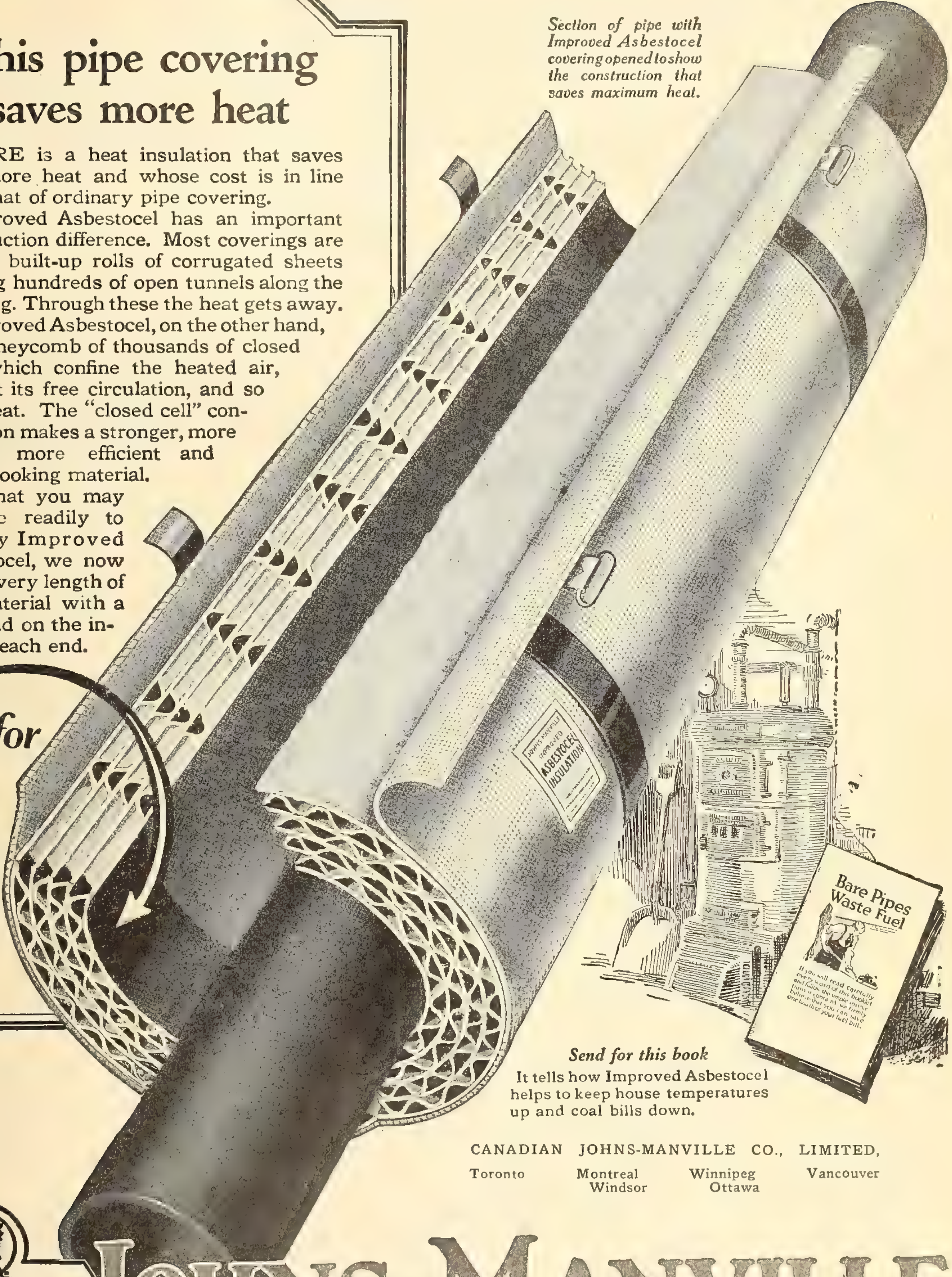
This pipe covering saves more heat

HERE is a heat insulation that saves more heat and whose cost is in line with that of ordinary pipe covering.

Improved Asbestocel has an important construction difference. Most coverings are merely built-up rolls of corrugated sheets forming hundreds of open tunnels along the covering. Through these the heat gets away.

Improved Asbestocel, on the other hand, is a honeycomb of thousands of closed cells which confine the heated air, prevent its free circulation, and so save heat. The "closed cell" construction makes a stronger, more lasting, more efficient and better looking material.

So that you may be able readily to identify Improved Asbestocel, we now mark every length of this material with a red band on the inside of each end.



Section of pipe with Improved Asbestocel covering opened to show the construction that saves maximum heat.

Look for the red band

JOHNS MANVILLE IMPROVED ASBESTOCEL INSULATION
Bare Pipes Waste Fuel
If you will read carefully every word of this booklet and follow the simple instructions it contains we firmly believe that you can save one fourth of your fuel bill.

Send for this book

It tells how Improved Asbestocel helps to keep house temperatures up and coal bills down.

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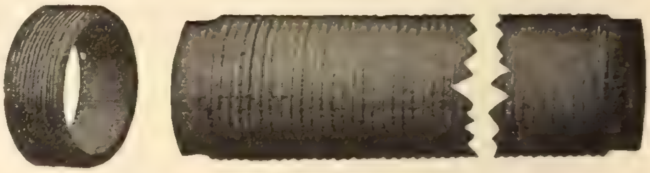

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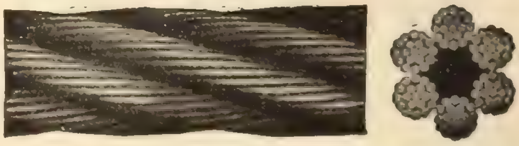

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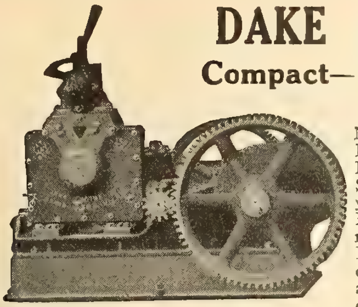

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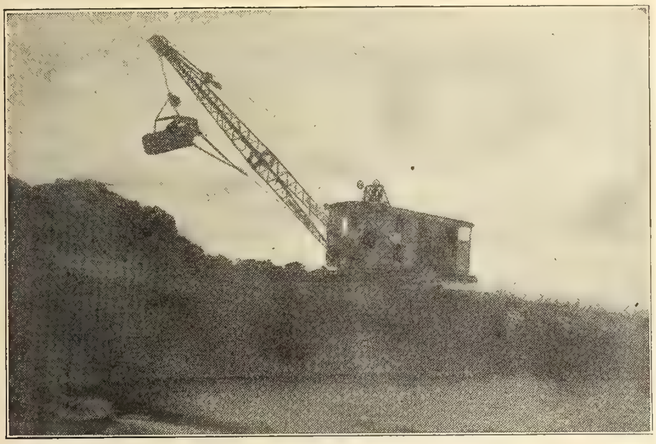

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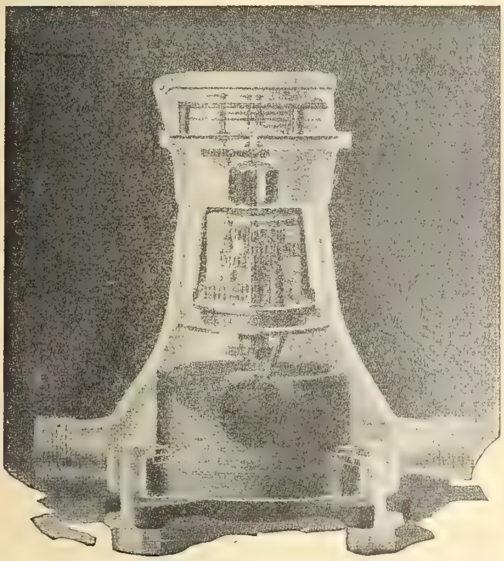

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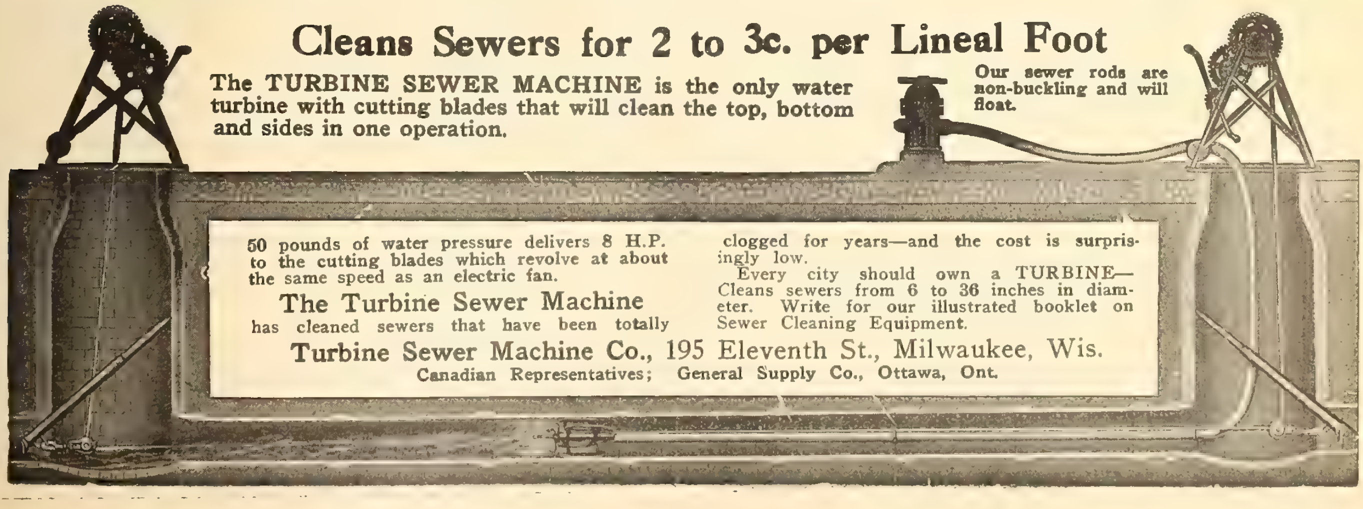

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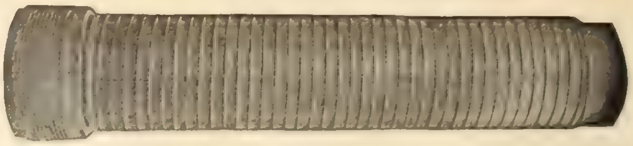

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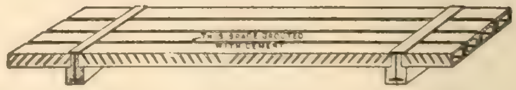

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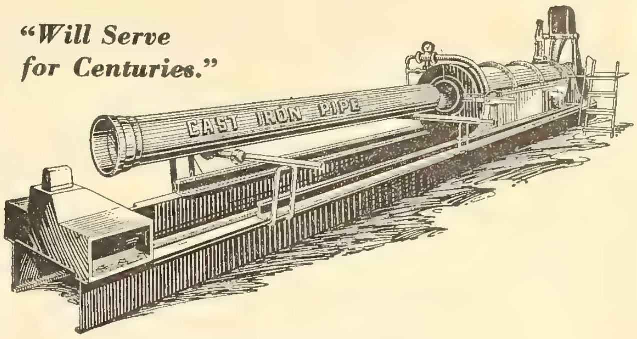

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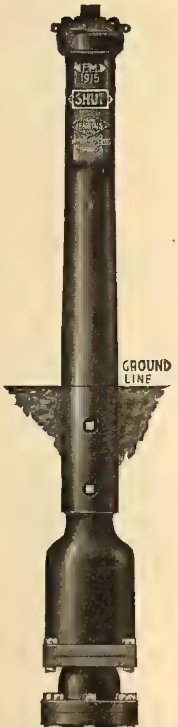

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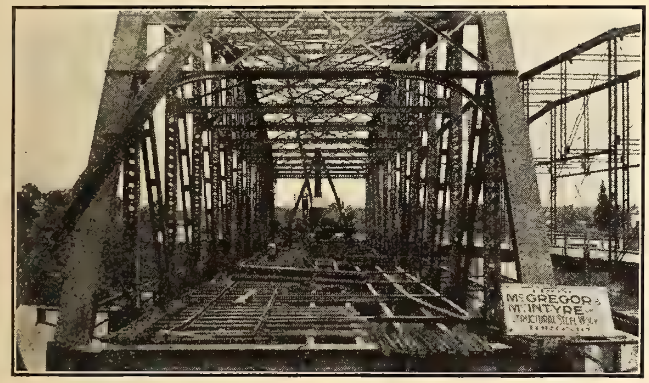

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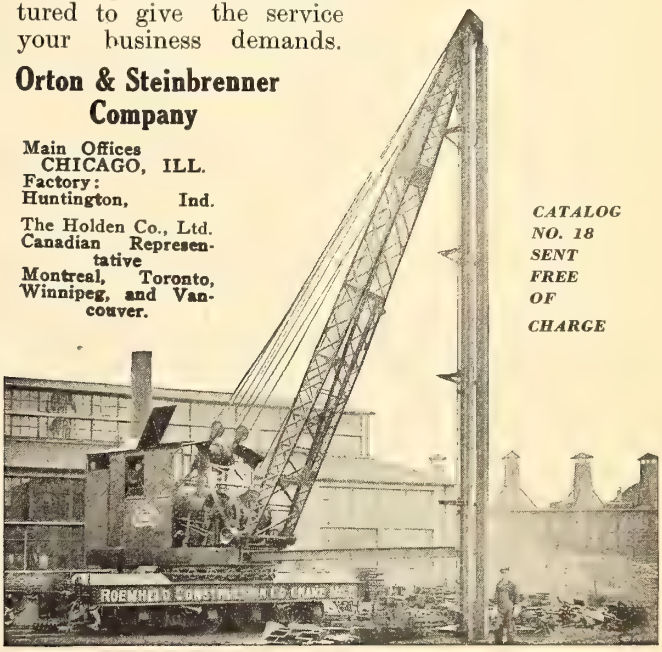

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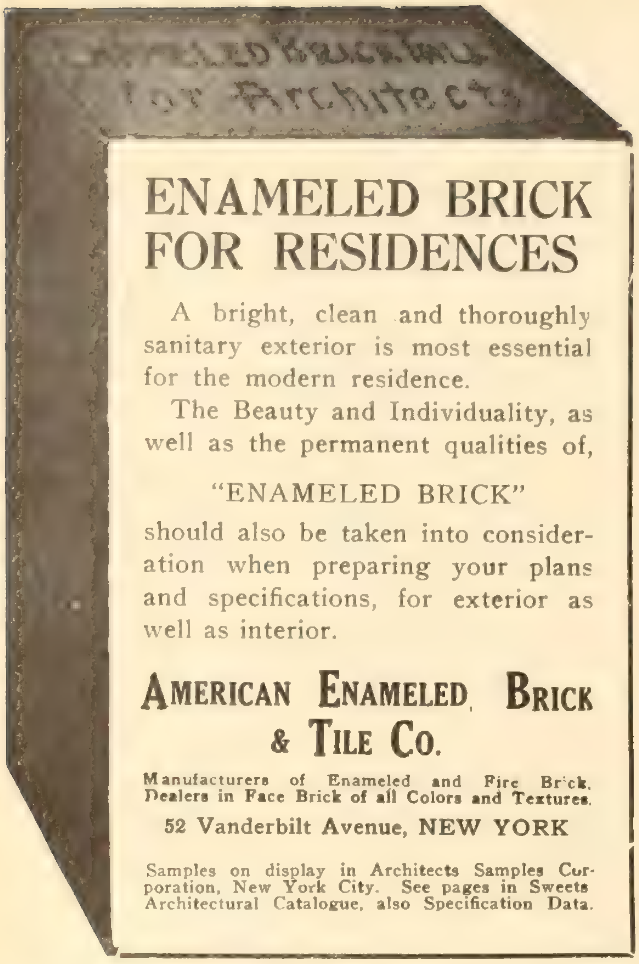

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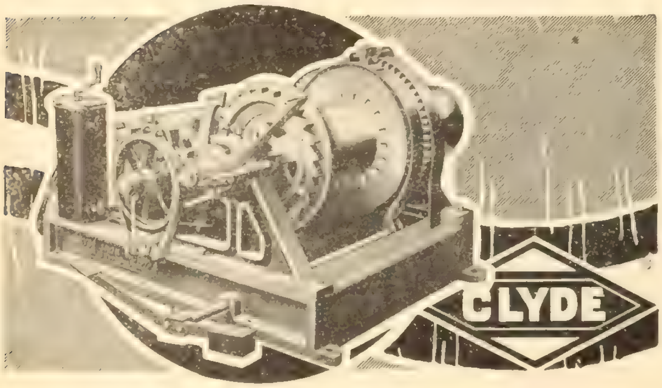

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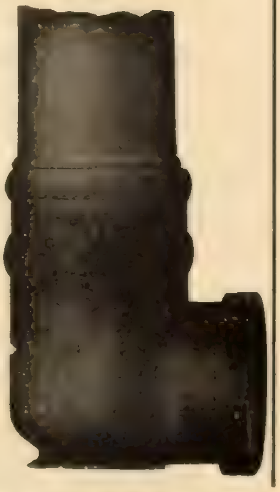

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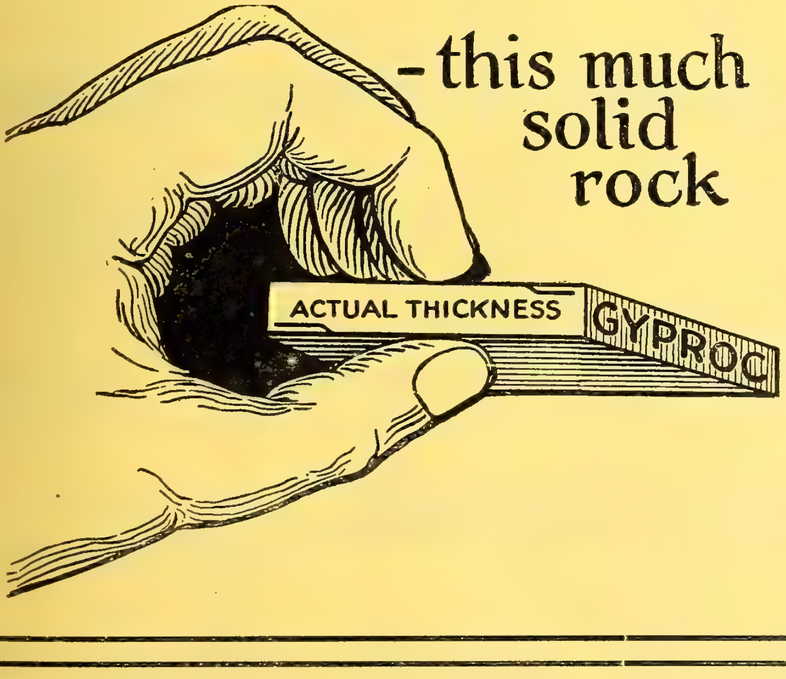
Toronto Offices: 106 Don Esplanade Montreal: 374 Beaver Hall Sq.
Factories: Caledonia, Ont., Lythmore, Ont.



Because of its unshrinkable and non-warping qualities, "Gyproc" can be used on the walls and ceilings of the most costly homes. Unlike ordinary wallboard, "Gyproc" stays put regardless of temperature to which it is subjected, forming a beautiful, perfectly flat surface without a wrinkle or roll.

When your Derricks, Cranes, Dredges, Shovels, etc., are fitted up with

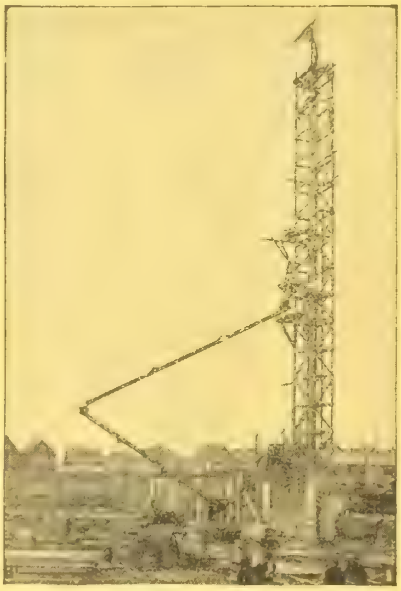
"Dominion" Cables

they are equipped to serve

Nothing is overlooked in the manufacture of our wire rope. We know the best rope to recommend for each particular requirement. It will be to your advantage to let us advise you.

The Dominion Wire Rope Company, Limited

Head Office: MONTREAL **Branches: TORONTO and WINNIPEG**



Ransome 96 ft. Swivel Head Boom Chute Plant

For Concrete Distribution use Ransome Chutes and Equipment

Standardization—Interchangeability of Parts and Unit Construction are demanded in all industrial lines today—This principle has been carried out in "Ransome" Chutes, also as they are properly designed—constructed of the highest grade materials—we assure you that "Ransome" Chutes are the most efficient to be obtained.

The Ransome Engineering Dept. backed by years of actual construction experience, is at all times ready to serve contractors or engineers in suggesting and laying out plants—for which service there is absolutely no charge.

Contractors' Equipment of all descriptions

HOISTING ENGINES — CONCRETE MIXERS — DERRICKS — PUMPS
CRANES — STEAM SHOVELS — ROAD ROLLERS — ROCK CRUSHERS
Drills — Scarifiers — Clamshell and Orange Peel Buckets — Pile Hammers
in fact—everything for the Contractor.

We would appreciate an opportunity to figure upon your requirements. We believe that we can prove that it will be to your advantage to concentrate your purchases.

Branch:
108 Mail Building,
TORONTO
Telephone Adelaide 840

F·H·Hopkins & Co. Limited

Head Office
MONTREAL
Telephone Main 3420

Vol. 37 Toronto, January 24, 1923 No. 4

Contract Record and Engineering Review

Garrison Road near Ridgeway. 16′ Asphalt Macadam 2 miles long

Welland Suburban Area Roads. 4½ miles of 16′ Asphalt Macadam

Asphalt Macadam and Welland County

Continuing a program of improving their County Road system, Welland County, this year, constructed several miles of Imperial Asphalt macadam roads. These were built by the Law Construction Company of Toronto using Imperial Asphalt Binder "B" and Windmill Point stone, a hard cherty limestone of exceptional wearing qualities.

Asphalt Macadam is the logical type of construction for county and suburban roads and for villages and smaller towns where traffic requires a superior pavement at moderate cost.

Asphalt Macadam is easy to construct, reasonable in first cost with very low maintenance charges for several years.

IMPERIAL Asphalt PRODUCTS

Paving Asphalts
Asphalt Binders
Liquid Asphalts
Asphalt Cold Patch

ROAD ENGINEERING DEPARTMENT
Imperial Oil Limited
Toronto Canada

Alphabetical Index to Advertisers Page 16 Classified Directory to Advertisements Page 6

A view of our 36″ Continuous Stave

Wood Pipe

in the famous Capilano Pipe Line which, after serving Vancouver City faithfully for over 15 years, is still in its infancy.

C. S. Pipe

is used successfully for hydro-electric purposes up to 14 ft. in diameter.

TANKS

and SILOS to Order

Any Size—Any Style

CONTINUOUS STAVE

Wood Pipe

or WIRE WOUND

YOU CAN NO LONGER RECKON WITHOUT WOOD PIPE

We have enthusiastic customers willing to assure you that recent improvements have so increased efficiency and durability as to place **Wood Pipe** on a plane with Cast Iron. These features at a low initial cost, combined with ease of transportation and installation, spell true **Economy.**

When writing for information and prices please specify diameter and pressure

Our Electric-Butt-Welded
STEEL
DOUBLE COUPLING
with Inside Ring
Galvanized

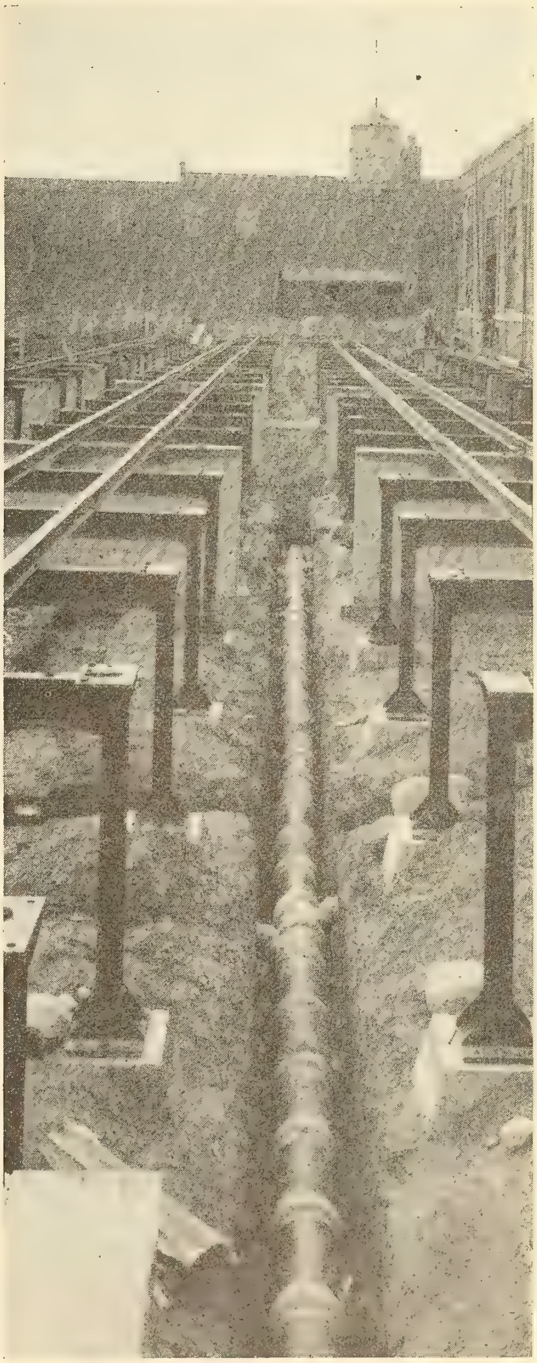
has entirely eliminated joint leaks and has perfected

WIRE WOUND PIPE

Canadian Pipe Company, Ltd.

550 Pacific St., VANCOUVER, B. C.

Two Miles of Vitrified Clay Pipe In Two of Toronto's New Car Barns



Extensive additions to the Car Barns were one of the first requirements in the rehabilitation of the street railway system when it was taken over by the Toronto Transportation Commission.

Vitrified Clay Pipe was not only used for drains and sewers but was also used in sizes from 30 inches in diameter for extensive hot air heating systems conveying hot air to the inspection pits so that frozen snow and ice can be rapidly removed from the running gear and brake equipment of the cars.

Heating Engineers also use Vitrified Clay Pipe for protecting steam pipes that have to be buried underground. Split pipe is supplied for this purpose though many engineers prefer to use the whole pipe where possible so as to secure greater tightness and better insulation.

For conveying industrial wastes or for polluted waters at a high temperature Vitrified Clay Pipe is the proved material. It does not corrode or disintegrate through chemical action and will give continuous and effective service.

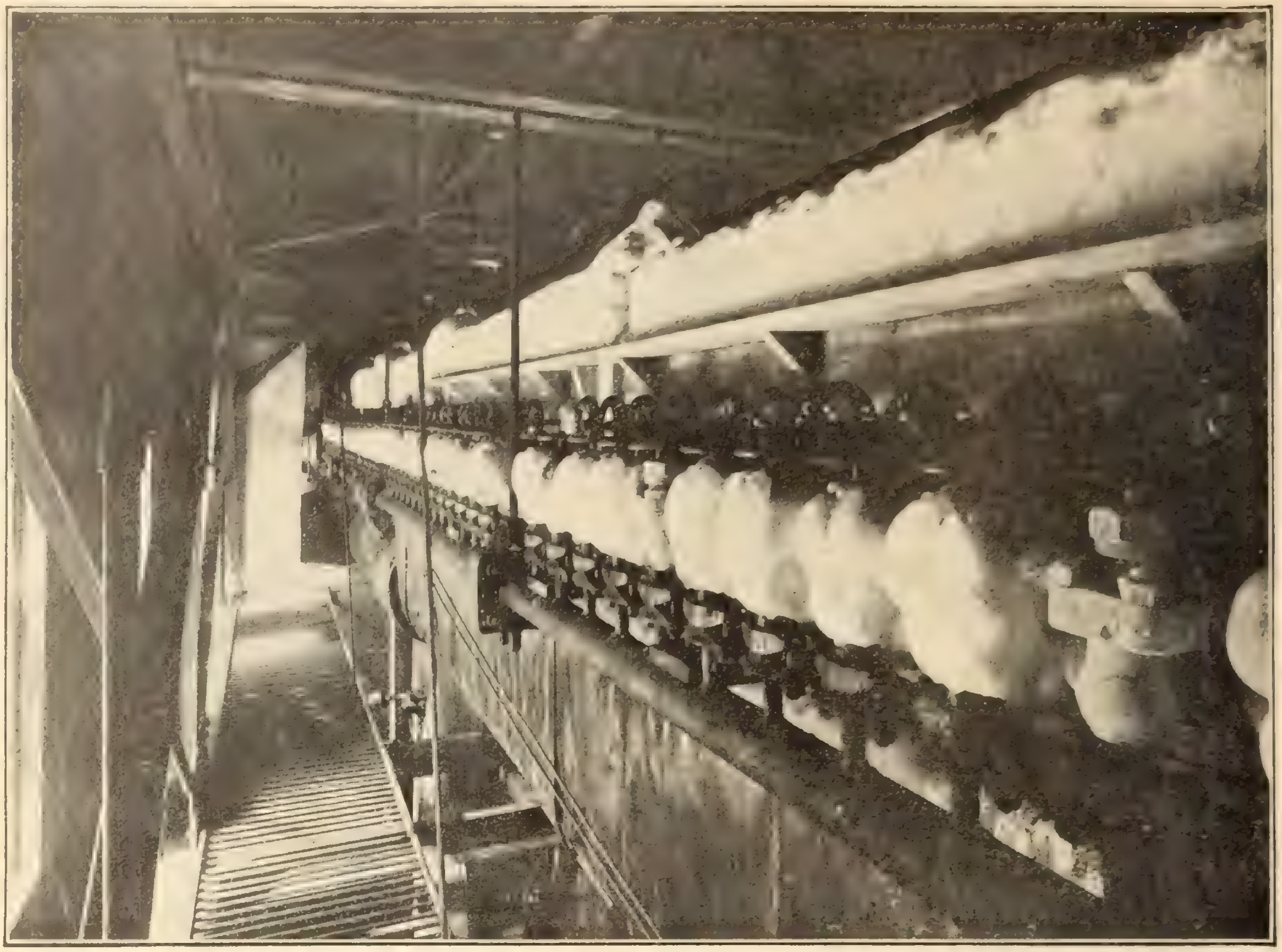
For quotations and particulars write to

Vitrified Clay Pipe Publicity Bureau

9 Wellington Street East, Toronto

St. Johns, P.Q.

New Glasgow, N.S.



CRANE

Ammonia Valves and Fittings

were used exclusively in the Construction of Refrigeration Plant, Montreal Board of Harbor Commission. All Ammonia Valves and fittings subjected to a rigid test of 300 pound air before leaving shops.

CRANE
LIMITED
HEAD OFFICE & SHOW ROOMS
386 BEAVER HALL SQUARE
MONTREAL
Works
1280 ST. PATRICK ST.
MONTREAL

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HAMILTON, LONDON, WINNIPEG,
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Sales Offices:
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CRANE-BENNETT
LIMITED
Head Office and Warehouse:
LONDON, ENGLAND.

Sales Offices:
BIRMINGHAM, CARDIFF,
GLASGOW, LEEDS, MANCHESTER.

Fire Demonstrations are given to help the dealer get more business

EACH season, the Ontario Gypsum Company gives a number of fire demonstrations in different parts of the country. A house is constructed entirely of Gypsum Products, and inflammable material, such as pine laths and shavings, are soaked with coal oil and placed inside the house, against the walls and on the roof. A torch is then applied and the fire blazes merrily for a half an hour or so. At the end of that time an inspection is made of the building. The crowd of spectators who have gathered to witness the demonstration are astonished to find that the fire has burned itself out and with little or no damage to the building. The effect of these demonstrations is tremendous and invariably result in increased business for the dealer.

This is only one method we have of bringing Gypsum Products to the attention of the public and getting more business for the dealer.

If you are a builders' supplyman, you should be handling Gypsum Products and getting your share of this profitable business. Gypsum Products have become as staple as crushed stone. They are being recommended and specified by the leading architects and builders throughout America. Home owners are recognizing their safety, their economy, their artistic appearance. Fire Chiefs and Underwriters urge their adoption. It only remains for you to give your trade the opportunity to buy.

Our 1923 Advertising Campaign

is now in full swing. We have many attractive cuts which we supply free to Gypsum dealers. Write us for full details today.

THE ONTARIO GYPSUM COMPANY LIMITED
Head Office: PARIS, Ont.
Toronto Offices: 106 Don Esplanade Montreal: 374 Beaver Hall Sq.
Factories: Caledonia, Ont., Lythmore, Ont.

Gypsum Products
If you have not complete data describing Gypsum Board, Gypsum Block and Gypsum Plaster, on file, drop us a card and they will be forwarded immediately.

Prospective home owners, tenants, fire chiefs, underwriters, civic officials, architects, contractors and dealers form the crowd at the fire demonstrations.

CLASSIFIED INDEX TO ADVERTISEMENTS

The following regulations apply to all advertisers:—Eighth page, every issue, three headings; quarter page, six headings; half page, twelve headings; full page, twenty-four headings

- Acid Proof Fans
  - Sturtevant, B. F. & Co.
- Air Washers
  - Sturtevant, B. F. & Co.
- Architect's Supplies
  - Geo. Vincent
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  - H. Mueller Mfg. Co., Limited
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  - Northern Architectural Iron Works
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  - Canadian Link-Belt Co.
- Asphalt
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  - Hamilton Bridge Works Co.
  - MacKinnon Steel Company
  - Sarnia Bridge Company
- Bearing Metal
  - H. Mueller Mfg. Co., Limited
- Blades
  - **Shunk Mfg. Co.**
- Blast Hole Drills
  - Hopkins & Co., Ltd., F. H.
  - Mussens Limited
- Blast Gates
  - Sturtevant, B. F. & Co.
- Blocks (Wire and Manila Rope)
  - **Clyde Iron Works Sales Co.**
  - Hopkins & Co., Ltd., F. H.
  - Leckie Co., John
- Blowers and Compressors
  - Canadian Blower and Forge Co.
  - Sturtevant, B. F. & Co.
- Boilers
  - Inglis Company, John
  - McGovern, T. J.
  - Mussens Limited
  - Waterous Engine Works Co.
- Boiler Inspection
  - Trades Labor Branch Dept Public Works
- Books (Technical)
  - Walker Co., Frank A.
- Boxes—Junction
  - Standard Underground Cable Co., of Canada, Limited
- Brick Dryers
  - Canadian Blower and Forge Co.
- Brick Machinery & Supplies
  - Hepburn, Ltd., John T.
- Brick
  - Don Valley Brick Co.
  - Milton Pressed Brick Co.
  - York Sandstone Brick Co.
- Bridges
  - Hamilton Bridge Works Co.
  - Horton Steel Works, Ltd.
  - Standard Steel Construction Co.
- Bridges (Steel)
  - Canadian Des Moines Steel Co.
  - Hamilton Bridge Works Co.
  - Horton Steel Works
  - McGregor & McIntyre
  - MacKinnon Steel Company
  - Sarnia Bridge Company
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  - **Canadian Austin Machinery**
  - Canadian Link-Belt Co.
  - Canadian Mead-Morrison Co.
  - Hopkins & Co., Ltd., F. H.
  - Mussens Limited
  - Orton & Steinbrenner Co.
- Building Materials
  - Britnell, Limited
  - Canadian Link-Belt Co.
  - Oakley & Sons Geo.
  - Rogers Supply Co.
  - **Standard White Lime Co.**
  - Vitrified Clay Pipe Publicity Bureau
- Building (Steel)
  - Standard Steel Construction Co.
- Cable
  - Dominion Wire Rope Co., Ltd.
  - Greening Wire Co., B.
  - Mussens Limited
  - Standard Underground Cable Co., of Canada Ltd.
- Cars—Steel Body
  - MacKinnon Steel Company
  - Mussens Limited
- Cars—Freight
  - Canadian Equipment Co.
- Car Wheels
  - Canada Iron Foundries
- Carrier Systems
  - Canadian Link-Belt Co.
- Castings—Grey Iron
  - Canada Iron Foundries
  - Hepburn, Ltd., John T.
  - H. Mueller Mfg. Co., Limited
- Caulking Tools
  - H. Mueller Mfg. Co., Limited
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  - Britnell & Company
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  - Cement Gun Co.
- Cement Hardener
  - Canada Cement Co.
  - Rogers Supply Co.
  - Spielman Agencies Regd.
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  - Dom. Tar & Chemical Co., Ltd.
  - Imperial Oil Company, Ltd.
  - Spielman Agencies Regd.
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  - London Concrete Machry. Co.
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  - Canadian Link-Belt Co.
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  - Canadian Inspection & Testing Laboratories
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  - Vitrified Clay Pipe Publicity Bureau
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  - **Canadian Equipment Co.**
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  - Canadian Mead-Morrison Co.
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  - London Concrete Machinery Co
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  - London Concrete Machinery Co.
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  - Dominion Concrete Company
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  - McLeod, Norman Ltd.
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  - Thomson Bros.
  - Provincial Contracting Co.
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  - United States Fidelity & Guaranty Company
- Contractors' Plant & Supplies
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  - **Canadian Equipment Co.**
  - Canadian Link-Belt Co.
  - Canadian Mead-Morrison Co.
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  - Hepburn, Ltd., John T.
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  - Thew Shovel Co.
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  - Canadian Mead-Morrison Co.
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  - Hopkins & Co., Ltd., F. H.
  - Mussens Limited
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  - Buckeye Traction Ditcher Co.
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  - Mussens Limited
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  - **Ball Engine Co.**
  - Buckeye Traction Ditcher Co.
  - **Canadian Austin Machinery**
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  - Mussens Limited
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  - Sturtevant, B. F. & Co.
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  - Otis-Fensom Elevator Co.
  - Turnbull Elevator Company
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  - American Enameled Brick & Tile Company
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  - Laurie & Lamb
  - Le Roy Company
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  - Waterous Engine Works Co
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  - Canadian Mead-Morrison Co.
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  - Geo. Vincent
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  - Buckeye Traction Ditcher Co.
  - **Canadian Austin Machinery**
  - **Canadian Equipment Co.**
  - Canadian Mead-Morrison Co.
  - **Clyde Iron Works Sales Co.**
  - Engineering & Machine Works. Co.
  - Erie Steam Shovel Co.
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  - Koehring Co., of Canada
  - Lumsden Engineering & Contracting Co.
  - Monighan Machine Co.
  - Mussens Limited
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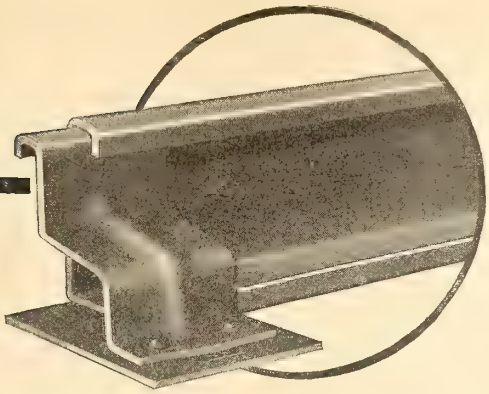
  - Canadian Blower & Forge Co.
  - Sturtevant, B. F. & Co.

(Continued on page 8)

"Armor Plate"

Steel Road Forms



Side View of HELTZEL Form

Breaking Records

in road-building

Whenever you read of some record breaking road construction, you're pretty sure to find that Heltzel Steel "Armor Plate" Road Forms were one of the important factors in speeding up the job.

Heltzel Forms work fast because you don't have to handle them with care—because there are not a hundred parts to monkey with. They save their cost.

Heltzel Forms have just three parts—rails, pedestals and stakes—yet they set as straight and solid as a railroad rail.

Write today for Form 30 A and read about a road form that is a road form

The Heltzel Steel Form & Iron Co.

Warren, Ohio

World's largest exclusive builders of steel forms for road, sidewalk, curb, curb and gutter and all types of concrete construction, also tamping machines, Heltzel Hand Strike-off Tamp, Heltzel Rotary Steel Float and other accessories.

See Our Exhibit at the January Chicago Road Show, Booths 214 and 215

HELTZEL
STEEL FORMS

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Sturtevant, B. F. & Co

Fans, Disc
Sturtevant, B. F. & Co.

Fans, Multivane
Sturtevant, B. F. & Co

Fans, Propeller
Sturtevant, B. F. & Co.

Fans, Silentvane
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Chew, Manley

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Laurie & Lamb

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McGregor & McIntyre

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National Fireproofing Co.
Vitrified Clay Pipe Publicity Bureau

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Furnaces
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Gantry and Cantilever Cranes
Orton & Steinbrenner Co.

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Consolidated Plate Glass Co.

Grader Blades
Shunk Mfg. Co.

Gravel
Allen Bros.
Paris Sand & Gravel Co.
Rogers Supply Co.

Gymnasium Apparatus
Coffey, J. G.

Hardwood Flooring
Eaton & Sons, J. R.

Hauling Contractors
Angstrom & Verochio
Lumsden Engineering & Transport Co.

Heating Apparatus
Canadian Blower and Forge Co
Crane, Limited
Sturtevant, B. F. & Co.

Hoists, Electric
Canadian Austin Machinery
Canadian Link-Belt Co.
Clyde Iron Works, Sales Co.

Hoists (Truck)
Dominion Truck Equipment Co

Hoisting Apparatus
Canadian Austin Machinery
Canadian Mead-Morrison Co.
Clyde Iron Works Sales Co.
Hopkins & Company, F. H.
London Concrete Machry. Co
Mussens Limited

Hoisting Engines
Hamilton Co., Wm.
Canadian Mead-Morrison Co.
Clyde Iron Works Sales Co.
General Products Co.
Hopkins & Company, F. H.
Koehring Co., of Canada
London Concrete Machry. Co
McGovern, T. J.
Mussens Limited
Turnbull & Co., Harvard

Hydrants
Canada Iron Foundries
Dominion Steel Products, Ltd
Kerr Engine Company
Gartshore-Thompson Pipe Co.
McAvity & Sons, T.
Hepburn, Ltd., John T.

Hydrated Lime
Melville Quarry Co

Ice Making Machinery
York **Manufacturing Co.**

Industrial Cars
Canadian Austin Machinery
Canadian Equipment Co.
Hopkins & Company, F. H
MacKinnon Steel Conmpany
Mussens Limited

Inspection Engineers
Canadian Inspection & Testing Laboratories
Hunt & Co., Robt. W.
Milton Hersey Company

Insulating Compounds
Dom. Tar & Chemical Co., Ltd
Imperial Oil Company, Ltd.
Spielman Agencies Regd.
Standard Underground Cable Co., of Canada Ltd.

Jib Cranes (all kinds)
Hamilton Bridge Works Co.

Joist Hangers
Hamilton Bridge Works Co.

Kilns
Canadian Blower and Forge Co
Horton Steel Works
MacKinnon Steel Conmpany

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American Lead Pencil Co.

Lime
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Hydrated Lime
Standard White Lime Co.

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Dennis Wire & Iron Works Co

Locomotive Cranes
Ball Engine Co.
Canadian Austin Machinery
Canadian Equipment Co.
Canadian Link-Belt Co.
Erie Steam Shovel Co.
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Koehring Co., of Canada
McGovern, T. J.
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Canadian Equipment Co.

Locomotive Gasoline and Storage Battery
Canadian Austin Machinery
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Ormsby **Company A. B.**

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Hamilton Bridge Works Co
Hamilton Co., Wm.
Horton Steel Works
Imperial Oil Ltd.
Mackinnon Steel Company

Orange Peel Buckets
Orton & Steinbrenner

Ornamental Iron
Dennis Wire & Iron Works Co

Ornamental Moulds
London Concrete **Machinery Co**

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Paints (Bridge and Structural Iron and Pipe Coating)
Canada Paint Co.
Dom. Tar & Chemical Co., Ltd
Imperial Oil, Co., **Limited**
Spielman **Agencies, Reg'd.**

(Continued on page 10)

Largest and Best Equipped Plant in Ontario

As evidence of our desire to give customers the highest grade product and the best service, we have installed the most modern equipment known to the industry.

A daily output of 3500 tons is being achieved and the stone, all sizes, comes clean and even in size.

Write, wire or phone your orders for quick action

Canada Crushed Stone Corporation Limited
DUNDAS ONTARIO

Toronto Agents:—John E. Russell Co., Ltd. Phone Adelaide 1600

Save the Cost of the Tank in Reduced Insurance Rates

CANADIAN TANKS DES MOINES TRADE MARK

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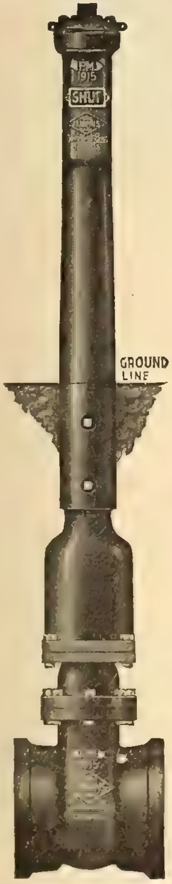

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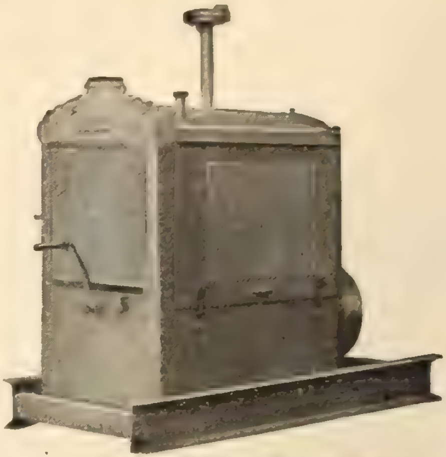

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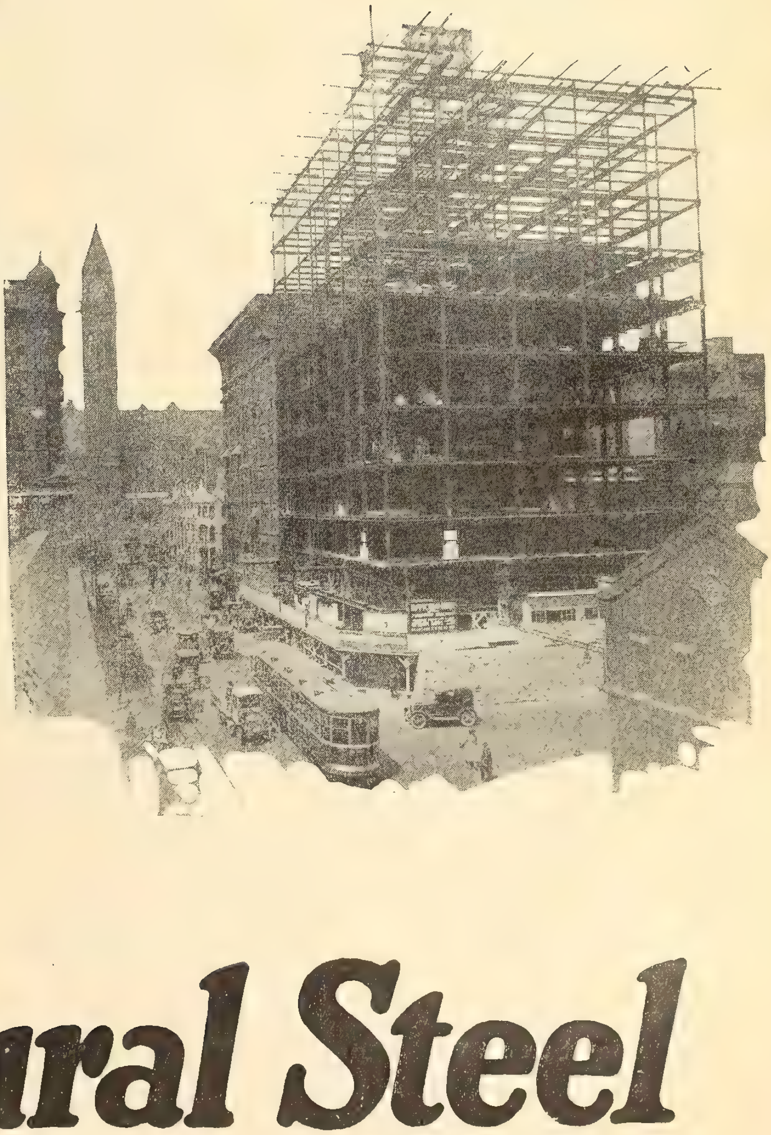

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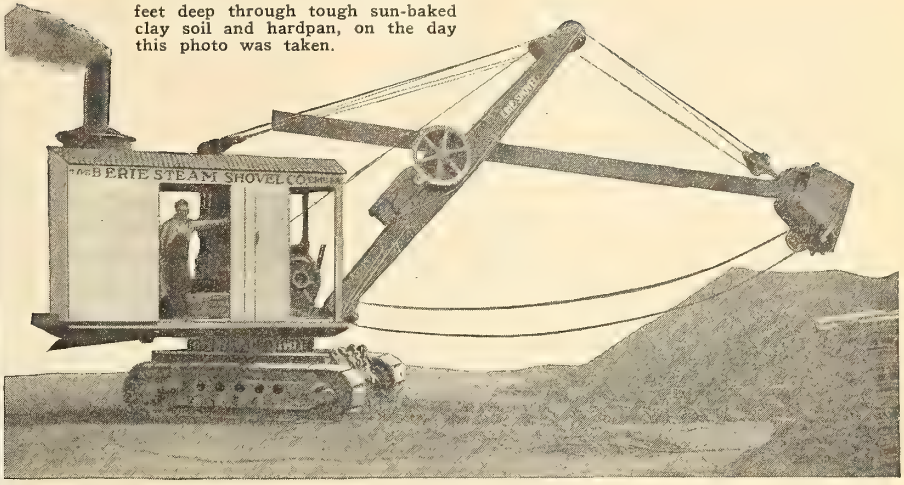
The ERIE Dragline shown above is owned by the Columbia Construction Co., Indianapolis, Ind. They dug 119 linear feet of trench in a 9-hour day — cutting 14 feet deep, 13 feet wide at the top and 6 feet wide at the bottom. Later, when it was necessary to clear telegraph poles, they changed the ERIE over to a Steam Hoe with equally good results.

The owner of the ERIE Steam Hoe shown below dug 170 linear feet of trench 4 feet wide and 11 to 17 feet deep through tough sun-baked clay soil and hardpan, on the day this photo was taken.



For *every* kind of trench work

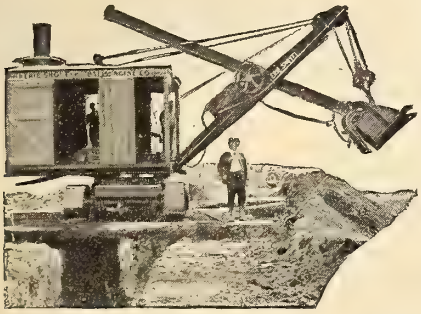
You can use your ERIE as the machine that's best suited

SOME TRENCH EXCAVATION is hard rock work — while some is through soft and sandy soil. On one job you have plenty of room to work — on the next, you have to watch out for telegraph poles, traffic, etc. Trench conditions vary, BUT—

For **every** kind of trench work, you can do a quick clean-cut job with your ERIE Shovel — **by using it as the machine best suited for that particular job.** Every ERIE can be used as Steam Shovel — as Locomotive Crane — or as Steam Hoe (an exclusive ERIE feature).

IN MATERIAL THAT IS VERY HARD TO DIG, BUT CAVES DOWN EASILY — such as cemented gravel and boulders — use the ERIE as a Steam-Hoe. It travels on solid ground ahead of the trench, eliminating cave-ins. The Steam Hoe has all the strength and power of a steam shovel — gives excellent results digging stiff shale, as well as sandy materials.

FOR EXTRA DEEP EXCAVATION, you can easily change your ERIE over to a Crane to handle Dragline Bucket, Clamshell or Orange-peel. Like the Steam Hoe, the ERIE Crane travels always on solid ground. The long boom permits dumping the material as far as 34 ft. away from the trench, if desired. The ERIE Crane also lays the pipe and does the backfilling.



AS A STEAM SHOVEL: On the job shown in the photo above, Bent Bros., of Los Angeles, Cal., used their ERIE as a Steam Shovel working over the trench on mats made of 12 x 12 timbers 27 feet long.

FOR UNUSUALLY HARD EXCAVATION or for jobs which are too small to make special attachments worth while — use your ERIE as a Steam Shovel, traveling over the trench on timber platforms. Gives excellent results in hard materials — where the ERIE Shovel's unusual power and strength are most appreciated.

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Write for Bulletin C-16

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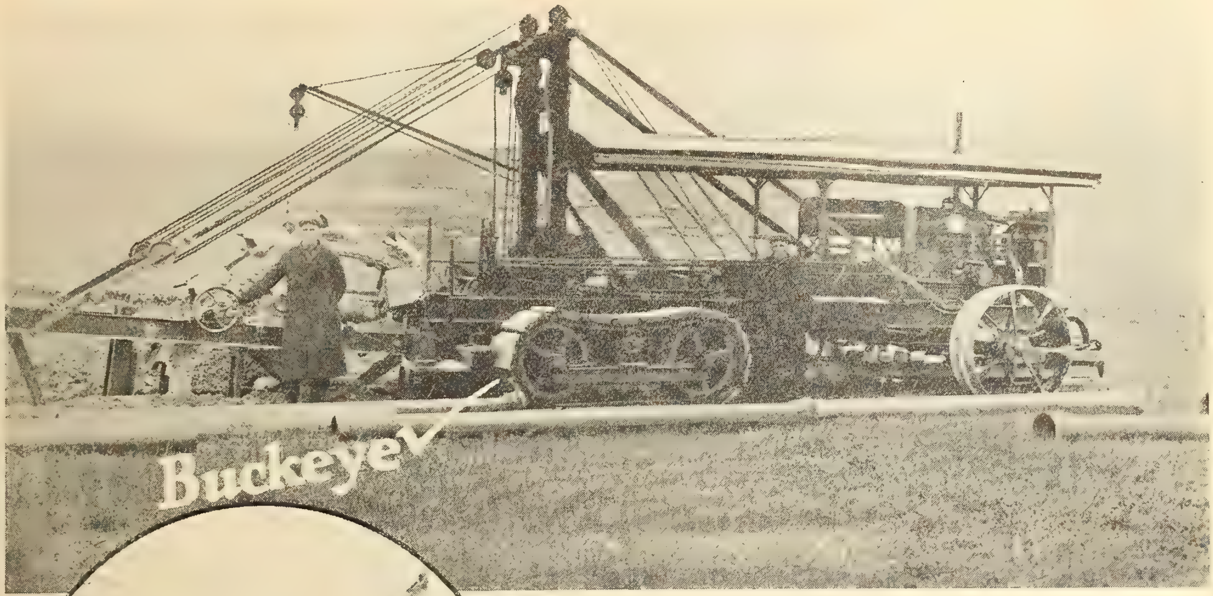

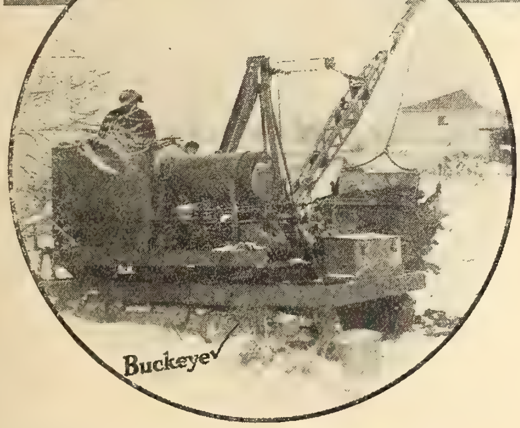

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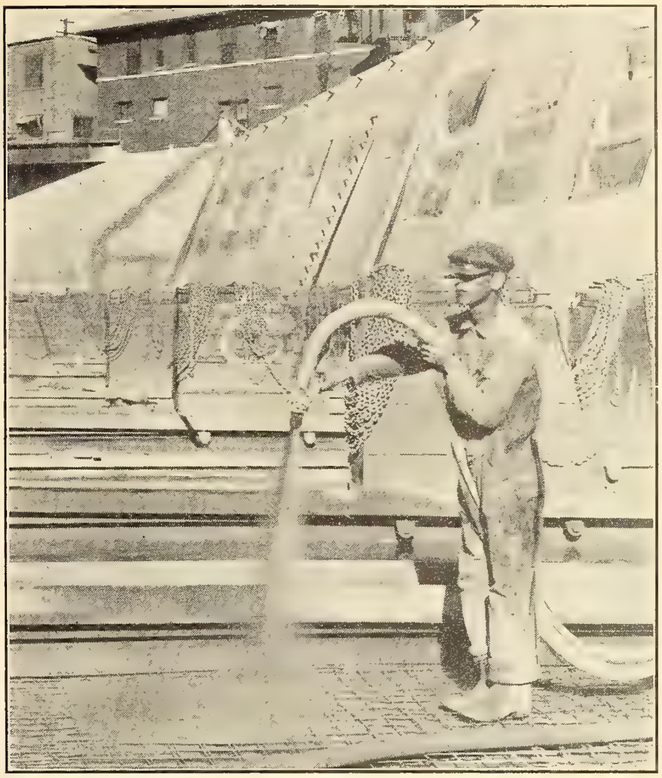

Work done and photo furnished by Cement-Gun Construction Co., Chicago

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Government Provides for Road Tests

According to information from A. W. Campbell, chief commissioner of highways for the Dominion, the Canada Highways Commission has purchased complete equipment for conducting standard tests on cement, asphalts, tars and road oils, for use upon the roads being constructed by the provinces in part in co-operation with the federal government under the Canada Highways Act. This equipment has been installed in the laboratory for testing materials, Department of Public Works, which now has complete testing equipment, in the hands of an experienced capable staff, for making tests on all kinds of road materials. It is believed that much waste from inferior materials in highway construction will be avoided when full advantage has been taken of the facilities now available for ensuring first-class materials and satisfactory results, particularly on Federal aid projects.

This move on the part of the roads department of the Dominion Government is in the right direction. Highway construction has now reached a high plane of development and empirical and haphazard methods have given place to methods based on sound engineering principles. This fact has resulted in the determination of tests for road building materials and in the accumulation of experimental data by which investigators are formulating sound principles for the guidance of road builders. In years past, roads have been built only to fail miserably because they were not able to withstand the onslaught of heavy intensive traffic. To-day, however, engineering knowledge has been extended to apply to the problems of road building with the result that the roads constructed at the present time give some indication of being scientifically designed for the work they have to do. If they are to fully meet the requirements expected of them, the materials of which they are constructed must adhere to proper specifications. This can be determined only by proper tests such as the new equipment of the Canada Highways Commission makes available. It is very creditable that this body should have taken the initiative in offering the facilities to road builders for conducting these tests. The amount of money that is being given over to roads in Canada demands that some assurance be given that value will be obtained for the expenditure. The Highway Commission's move is one step in this direction.

Labor Output Must be Increased

What is wrong with labor? This question has been asked so frequently of late years that it seems almost superfluous to bring up the matter again. And yet it is a question that is of just as vital importance to-day as ever. Economists see a situation that needs some remedy and needs it quickly. Just recently James S. Alexander, president of the National Bank of Commerce in New York, which views business and industrial affairs with a very critical eye, stated that the present labor situation cannot continue indefinitely and that unless conditions change, serious results will follow. His comments are interesting enough to bear repeating:

"The most unfortunate feature of the labor problem in this country is the question of curtailed output. Apparently, labor fails to recognize the essential difference between combinations among workmen to raise wages and combinations to curtail physical output by working rules and by opposition to improved machinery.

"To put the fact simply, if three men are required by union rules to tend a machine which two could operate, the two in fact support a third in idleness. If a bricklayer who could lay a thousand bricks a day lays but three hundred, he himself and his fellow workers are the prime sufferers. They pay the penalty in high rents.

"It is the duty of that part of the community now penalized by high labor costs, including a large proportion of the wage earners of the country, farmers, manufacturers, and the general public, to omit no effort to develop a compelling public opinion in regard to this problem."

Does Concrete in the Floor Slab Reduce the Stresses in Steel Joists?

Tests Carried out on Steel Framed Panels Before and After the Pouring of Concrete Slabs and Fireproofing Indicate Much Lower Flange Stress Through the Action of the Concrete

In current practice steel joists encased in concrete and supporting reinforced concrete floor slabs are designed to take the entire load, including the weight of the concrete, with a flange stress not to exceed 16,000 lbs. per square inch. The object of certain tests being constructed under the auspices of the Steel Branch of the Canadian Manufacturers Association, is to determine the amount, if any, by which the stresses in the joists are reduced, due to the action of the concrete in the floor slab and fireproofing.

For this purpose, two identical panels have been constructed, the details of which are shown in the accompanying drawing. The slab and fireproofing is of 1:2:4 concrete, of moderately wet consistency, and placed in accordance with good ordinary practice. Sample cylinders have been taken to be tested, when cured under the same conditions as the slabs. The construction of the panels is such that there is little or no end restraint in the joists.

The plan of tests includes accurate measurements of the deflections and flange stresses in the joists under the same applied loads, before and after concreting. The applied loads consist of steel I-beams, whose weights have been actually scaled. These are uniformly spaced, and laid at right angles to the axes of the joists. Before being applied, these loading beams rest on 12 x 12 timbers which are in turn supported by jacks. The load is applied or removed by raising or lowering the jacks.

Deflections are measured by means of micrometer calipers; flange stresses by means of both Martens mirror extensometers and a Howard gauge, applied to the lower flanges at the centres of the joists. The extensometers read to one hundred thousandth of an inch over a 4 in. gauge length, the Howard gauge to one ten thousandth inch on a 10 in. gauge. The check insured by these two entirely different methods of measurement leaves no room for error of any consequence in the results.

The tests made were as follows:—

1. After erection but before pouring the concrete, a load was applied equal to the estimated weight of the concrete, or about 75 lbs. per sq. ft. Subsequent weighing of the concrete showed this estimate to be practically correct. The stresses in the lower flanges of the I-beams due to this load were then measured by two different methods, and the deflections of the beams were also measured.

Results:

Flange stress, calculated	6,345 lbs. per sq. in.
Flange stress, measured (av.)	6,360 lbs. per sq. in.
Deflection, calculated	0.167 in.
Deflection, meashred	0.164 in.

2. A live load of about 110 lbs. per sq. ft. was next applied and the flange stresses and deflections due to this load measured.

Results:

Flange stress, calculated	9,195 lbs. per sq. in.
Flange stress, measured	8,610 lbs. per sq.in.
Deflection, calculated	0.241 in.
Deflection, measured	0.230 in.

The stresses and deflections resulting from the above two loads combined were therefore:

Flange stress, calculated	15,540 lbs. per sq. in.
Flange stress, measured	14,970 lbs. per sq. in.
Deflection, calculated	0.407 in.
Deflection, measured	0.394 in.

The close agreement of the above results showed the reliability of the methods used in making the measurements.

3. After the concrete had been poured and cured for 23 days, the flange stresses in the beam were again measured. The result was an average stress of 6,780 lbs. per in. as against 6,360 for an equivalent load in test No. 1. As the forms were suspended from the beams and not removed until after the concrete had set, any deflection due to their weight could not be recovered fully when they were removed. Some such increase of stress was therefore to be expected.

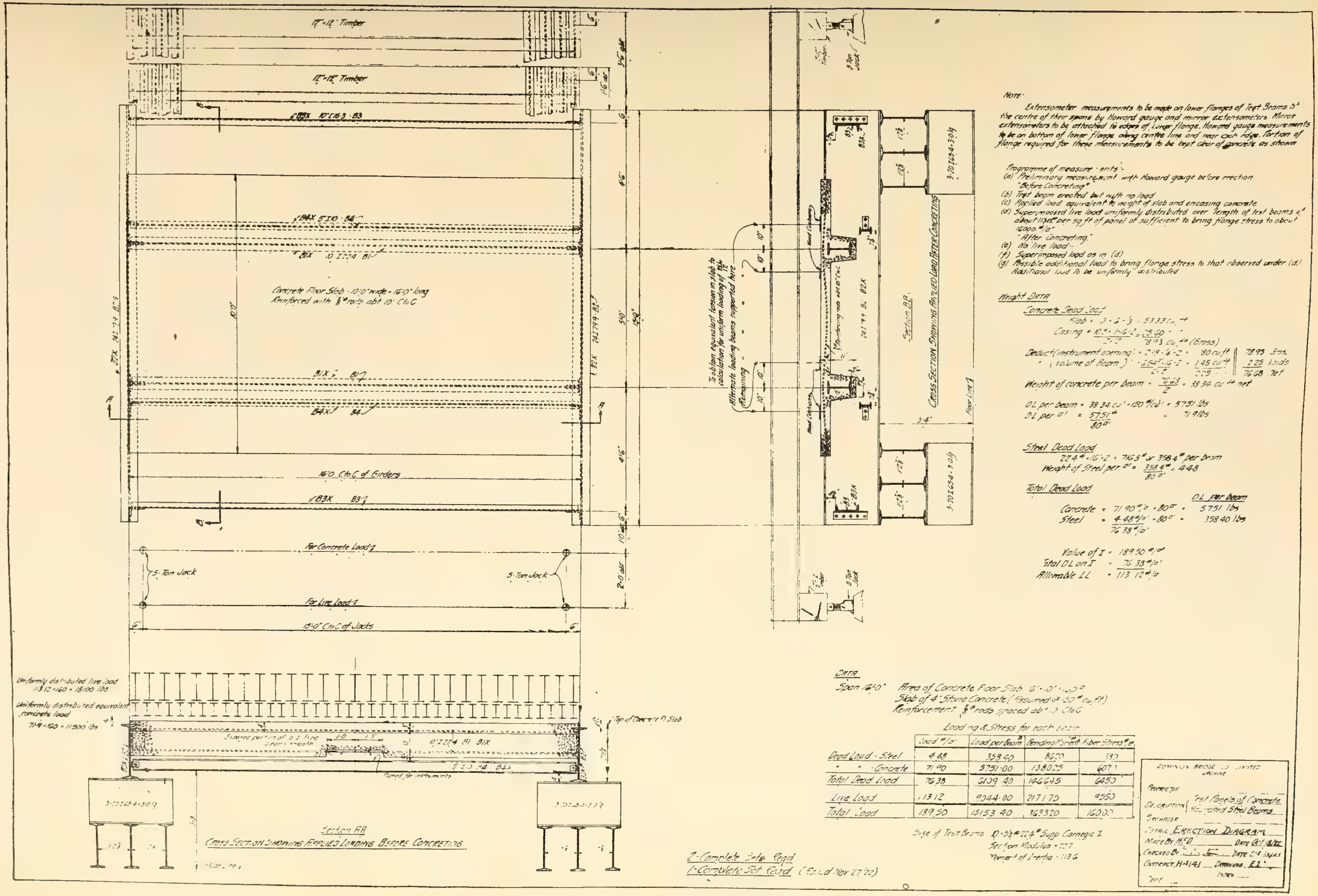
4. The previous live load of 110 lbs. per sq. ft. of slab was again applied. The load was now the same as in test No. 2. The observed flange stress was, on the average, 2,750 lbs. per sq. in. as against 8,610 for the same load in test No. 2, before concreting. The average deflection was 0.036 in. as compared with 0.230 in. before concreting.

5. No further tests were made on panel No. 2 which proved slightly the stiffer throughout the above tests. The live load on panel No. 1 was however increased about 50% above the normal. The observed flange stress due to this increased live load was 5,100 lbs. per sq. in., and the deflection 0.067 in.

6. The live load was next increased to 100% above the normal and the flange stress was found to be 7,600 lbs. per sq. in. or 1,000 lbs. less than that due to half as great a load before concreting. The deflection due to this load was 0.101 in. or less than half as much as that due to half as great a load before concreting.

Combining the above figures it appears that the flange stress due to the dead and normal live loads together is about 36% less after concreting than before. The stress due to the dead load and a live load 50% above the normal, acting together is some 20% less after concreting than that due to the dead and normal live load before concreting. Finally, after concreting the beams sustained the dead load and twice the normal live load with a smaller flange stress than that due to the dead and normal live load before concreting.

These tests are being conducted by Professors H. M. MacKay of McGill University, Peter Gillespie of the University of Toronto, C. Leluau of the University of Montreal. The tests are carried out at the works of the Dominion Bridge Co., Lachine, P. Q.


12"×12" Timber
12"×12" Timber
B3X 10"C15·3·B3
B4X 5"I10·B4
B1X 10"I22·4 B1
Concrete Floor Slab · 10'0" wide · 16'0" long
Reinforced with 3/8" rods abt 10" C to C
B1X B1
B4X B4
16'0" C to C of Girders
B3X B3
For Concrete Load
5-Ton Jack
5-Ton Jack
For Live Load
15'0" C to C of Jacks
Uniformly distributed live load 113.12×160 = 18100 lbs
Uniformly distributed equivalent concrete load 71.9×160 = 11500 lbs
Top of Concrete Fl. Slab
10"I22·4 B1 B1X
Painted for instruments
Section AA
Cross Section Showing Applied Loading Before Concreting
To obtain equivalent tension in slab to calculation for uniform loading of 1/2
Alternate loading beams supported here
Remaining
Section BB
Cross Section Showing Applied Load After Concreting
Floor Line
3-70 I 25·4-30·9
Note:
Extensometer measurements to be made on lower flanges of Test Beams at the centre of their spans by Howard gauge and mirror extensometers. Mirror extensometers to be attached to edges of lower flange. Howard gauge measurements to be on bottom of lower flange along centre line and near each edge. Portion of flange required for these measurements to be kept clear of concrete as shown
Programme of measurements:-
(a) Preliminary measurement with Howard gauge before erection
"Before Concreting"
(b) Test beam erected but with no load
(c) Applied load equivalent to weight of slab and encasing concrete
(d) Superimposed live load uniformly distributed over length of test beams of about 113# per sq ft of panel or sufficient to bring flange stress to about 16000 #/□"
"After Concreting."
(e) No live load:-
(f) Superimposed load as in (d)
(g) Possible additional load to bring flange stress to that observed under (d) Additional load to be uniformly distributed
Weight Data
Concrete Dead Load
Slab = 10·5·1/3 = 53.33 cu ft
Casing = 10.5·1·16·2 / 12·12 = 25.60 " "
78.93 cu ft (Gross)
Deduct (instrument opening) = 2·9·4·2 = .80 cu ft
" (volume of Beam) = 6.54·16·2 / 12·12 = 1.45 cu ft
2.25 " "
78.93 Gross
2.25 Voids
76.68 Net
Weight of concrete per beam = 76.68 / 2 = 38.34 cu ft net
DL per beam = 38.34 cu' × 150 #/cu' = 5751 lbs
DL per □' = 5751# / 80□' = 71.9 lbs
Steel Dead Load
22.4# × 16 × 2 = 716.8# or 358.4# per beam
Weight of Steel per □' = 358.4# / 80□' = 4.48
Total Dead Load
DL per beam
Concrete = 71.90 #/□' × 80□' = 5751 lbs
Steel = 4.48 #/□' × 80□' = 358.40 lbs
76.38 #/□'
Value of I = 189.50 #/□'
Total DL on I = 76.38 #/□'
Allowable LL = 113.12 #/□'
Data
Span 16'0"
Area of Concrete Floor Slab 8'×10' = 80□'
Slab of 4" Stone Concrete (Assumed @ 150# cu ft)
Reinforcement 3/8" rods spaced ab't 10" C to C
Loading & Stress for each beam
Size of Test Beams 10"×5 1/2" @ 22.4# Supp Carnegie I
Section Modulus = 22.7
Moment of Inertia = 113.6
2-Complete Sets Repd
1-Complete Set Card (Filed Nov 27 '22)
Dominion Bridge Co. Limited, Lachine
Proprietor
Description: Test Panels of Concrete Encased Steel Beams
Purchaser
Detail: Erection Diagram
Made By H.F.D. Date Oct 18/22
Checked By Date
Contract H-2141 Drawing E1
Index
Dept.

	Load #/□'	Load per Beam #	Bending Moment	Fiber Stress #/□"
Dead Load - Steel	4.48	358.40	8620	380
" " - Concrete	71.90	5751.00	138025	6070
Total Dead Load	76.38	6109.40	146645	6450
Live Load	113.12	9044.00	217175	9550
Total Load	189.50	15153.40	363820	16000

Details of test panels used for the study of the effect of concrete on flange stress

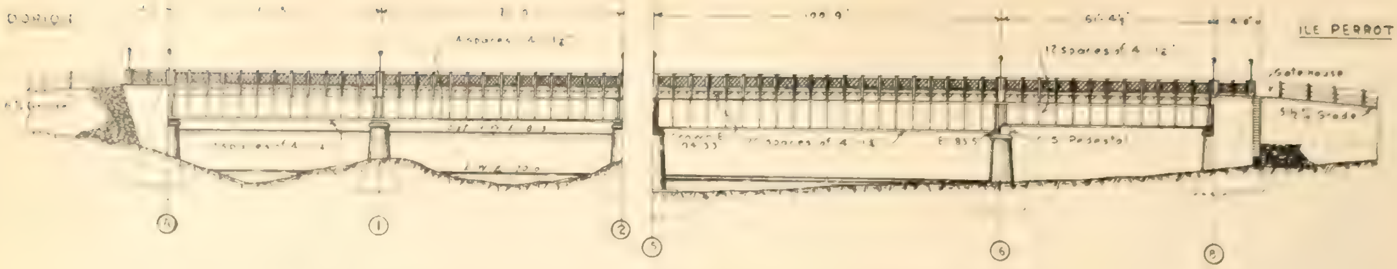


Fig. 1—Elevation of the Ile Perrot bridge which is to be constructed this year

1750 ft. Bridge Across the Ottawa River

Deck Plate Girder Type of Structure will be Erected from the Perrot to Dorion, Near Montreal—Concrete Arch Bridge was an Alternative Design—To be Completed This Year

By the Contract Record's Ottawa Correspondent

A commission composed of business men of Montreal and the city's western suburbs together with representatives of the municipalities west of the island, was formed some 3 or 4 years ago with the object of promoting the absolute necessity of another highway connection between the island of Montreal and the mainland west of it, and after constant work on the part of the commission the erection of the long hoped for Ile Perrot bridge will now soon be an accomplished fact. The new bridge will cross the Ottawa river from Ile Perrot to Dorion, a small village situated a short distance south of Vaudreuil, and will run close and parallel to the Grand Trunk and Canadian Pacific railway bridges. The bridge will directly connect the main Quebec roads to the Montreal-Toronto highway.

Several designs were submitted for consideration by the bridge commission, among which was one of reinforced concrete and others of steel and concrete, and after due consideration to the commission's criticism of the several designs, and the insistent demand for traffic accommodation which made it imperative that the construction should go on with all possible speed, the steel and concrete design was finally decided upon. The inadvisability of building a concrete arch bridge on earth foundations was also taken into account. The accompanying illustrations show details of the reinforced concrete design and of the adopted steel and concrete structure.

The work has already been started and will be pushed ahead with the least possible delay, and it is expected that the bridge will be completed by the end of the present year. A contract for the piers and abutments has been awarded to the Dufresne Construction Co. of Montreal, for a lump sum of $136,000 and the contract for the steel work has been awarded to the Dominion Bridge Co., for $125,000.

The total length of the bridge including approaches, will be 1,750 ft., or 1,395 ft. face to face of back walls, and will comprise 17 spans of lengths varying from 61 ft. 4 in. to 100 ft. 9 in. centre to centre of piers.

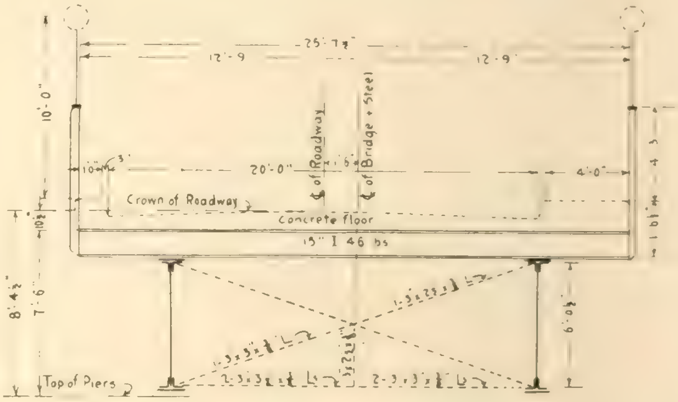


Fig. 2—Section of the bridge

In accordance with instructions, the adopted steel and concrete structure is designed to carry a 20 ton roller. It will have a 20 foot roadway and a four foot sidewalk on one side only. The maximum load under

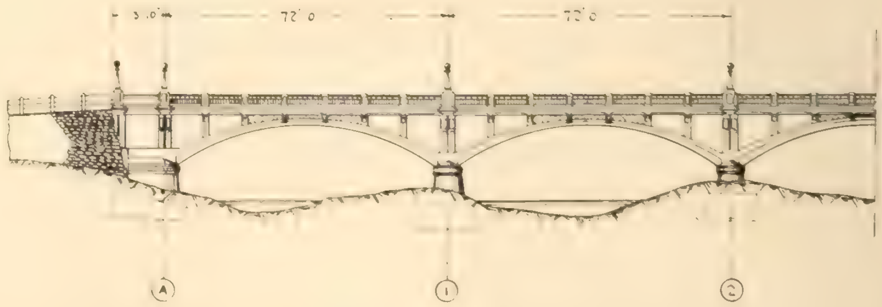


Fig. 3—The alternative design—a reinforced concrete arch type

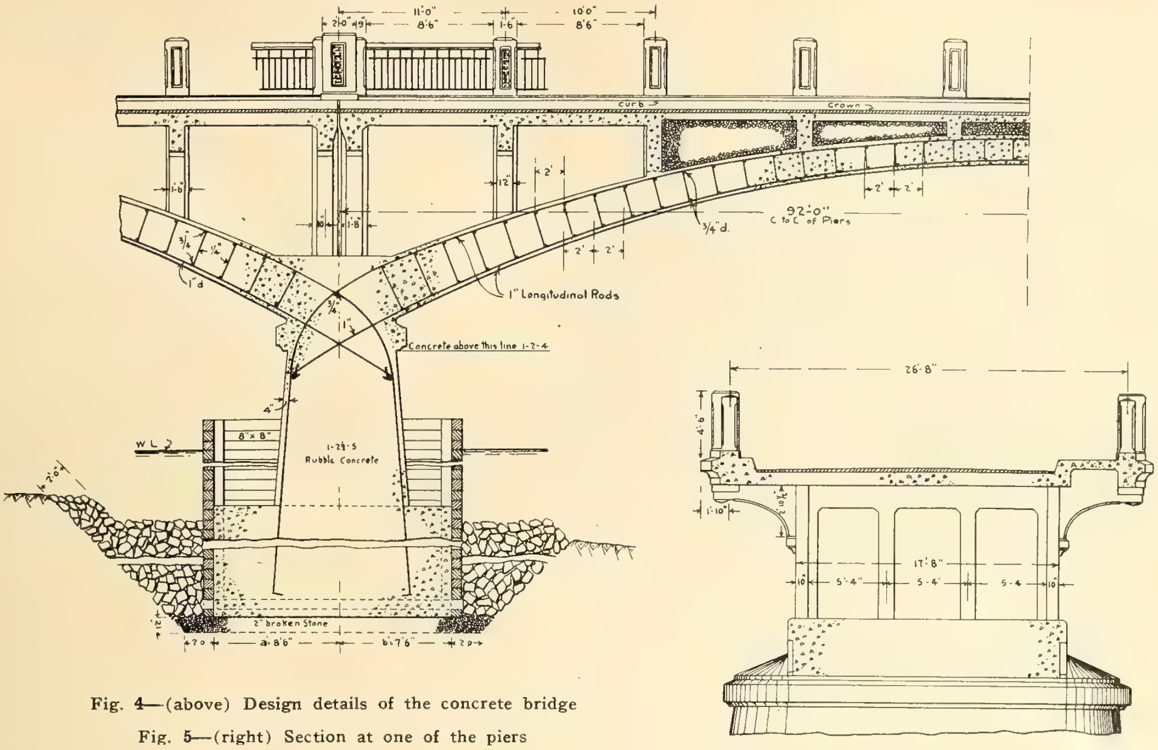


Fig. 4—(above) Design details of the concrete bridge

Fig. 5—(right) Section at one of the piers

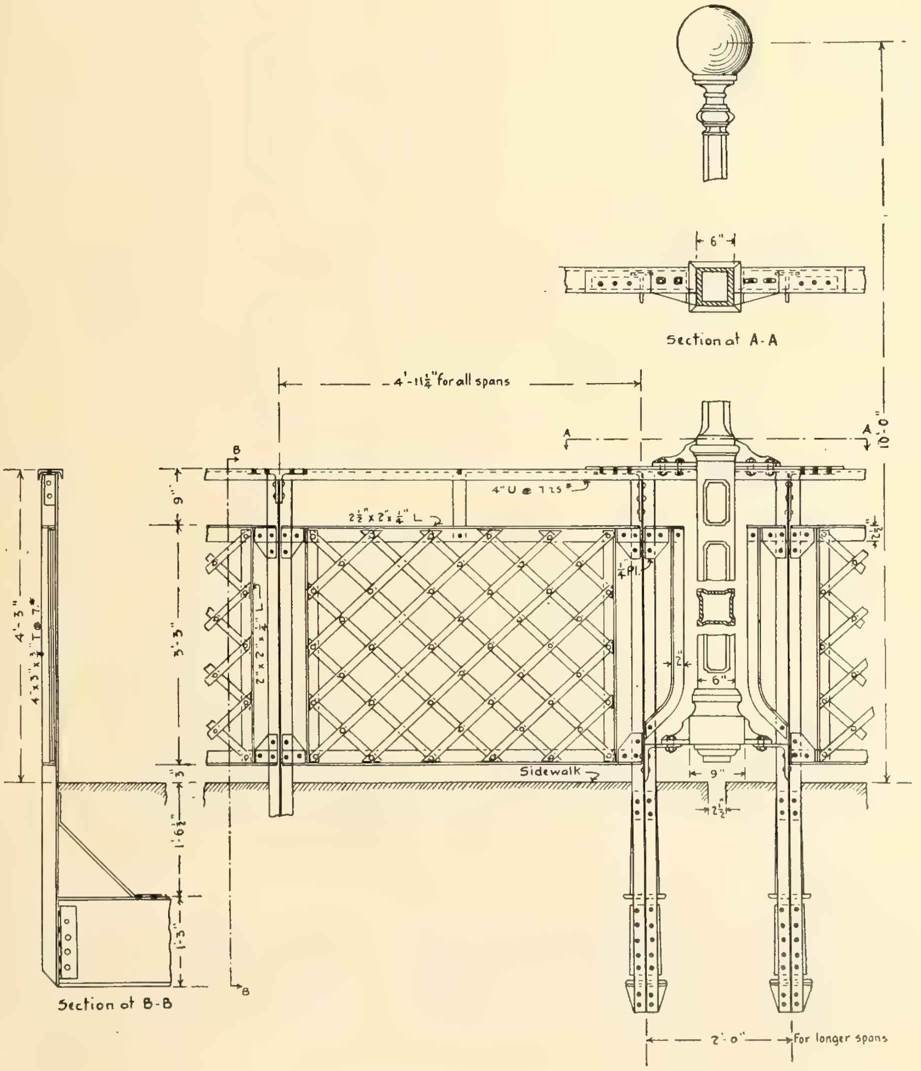


Fig. 6—Details of the balustrade of the plate girder bridge

the piers, which are built according to the design shown on fig. 4, was taken at one and three quarter tons per sq. foot (hydrostatic uplift not considered). The nature of the foundations for the piers, as determined by borings, is mostly packed sand, gravel and boulders with layers of clay, particularly towards the centre of the river. It is expected that after the excavation is completed, it will be possible to decrease the layer of broken stone under some of the piers to reduce the footing and increase the maximum load per sq. foot, but toward the centre of the river where rather soft clay will likely be encountered, it may be advisable to increase the footing and reduce the load to one or one and a quarter tons per sq. foot.

A deck plate girder type of bridge was selected on account of the saving in the masonry and structural work as compared with the through truss type. A minimum thickness of 3/8 in. for the steel was adopted, excepting the handrail where it will be 3/16 in. Care was taken to reduce the number of templets and to simplify shop work as much as possible to save time. Absence of top laterals in the steel work is to be noted, the cross frames being made strong enough to transmit the top chord stresses to the bottom laterals, but on account of the rigidity of the concrete slab, the end frames were assumed to transmit the whole top chord wind stresses.

The bridge floor which will be made of concrete, will have a thickness of 10½ in. at the crown. The balustrade will be of ornamental iron, details of which are shown on fig. 6.

The reinforced concrete suggestion was of the arch type, and was designed to comprise 17 piers and abutments carrying spans of three different lengths 72, 82 and 92 feet respectively. The reasons for the elimination of this type of structure are given above.

The following table gives the thickness of the arches for the different lengths of spans:

Span, C to C	92′– 0″	82′– 0″	72′– 0″
At crown	22″	20½″	19″
At springings	44″	41″	38″

The estimated quantities of the materials to enter into the work are as follows:

Piers and abutments;
810 cu. yds. of 1-3 -6 mix.
2,620 cu. yds. of 1-2½-5 mix.
170 cu. yds. of 1-2 -4 mix.

3,600 cu. yds.

Dry masonry in approaches: A total of 1,360 cu. yds.

Rip-rap in piers and abutments: A total of 2,600 cu. yds.

Steel structure (exclusive of handrail and lamp standards): 805 tons.

Railing, exclusive of lamp posts: 77 tons.

Concrete roadway: 960 cu. yds. of 1-2-4 concrete, 120,000 lbs. of steel reinforcing, and 160 cu. yds. of surfacing.

Total excavation: 5,500 cu. yds.

Total fill (approaches): 5,000 cu. yds.

All plans in connection with the above described bridges were prepared by Mr. L. V. Denis, B.A.Sc., Senior Assistant Engineer, Dominion Department of Public Works, District of Montreal. He also has complete charge of the erection of the work, under the direction of Mr. I. Vallee, B.A.Sc., Chief Engineer of the Quebec Department of Public Works.

Letters to the Editor

In Accord with Apprenticeship Scheme

Hamilton, Ont.,
Jan. 17, 1923.

Editor, Contract Record:

In your issue of December 20 we note an article by Mr. Pigott outlining a scheme for the training of apprentices for the building industry. We realize that the position of industry with regard to apprentices is acute and are of the opinion that the plan as outlined by Mr. Pigott seems to be the most feasible yet advanced. In regard to the solution we can only say that we are heartily in accord with it.

We understand that this question will be given considerable prominence at the approaching convention of the Association of Canadian Building and Construction Industries and we wait with interest the outcome of it.

Yours very truly,
W. H. Yates Construction Company, Ltd.,
per A. R. MacPherson,
Vice-president.

Mr. Pigott's Plan is Logical

Editor, Contract Record:

The situation with regard to trained mechanics as outlined in Mr. J. M. Pigott's article in your December 20th issue is not peculiar to the building trades of Ontario alone. It is common to many other trades all over Canada.

Mr. Pigott's suggestion that boys be trained locally is the logical solution of the problem, but is it equitable that the cost of training these boys, whose skilled services are an asset to the whole country, should be borne locally (Workmen's Compensation Board jointly with the provincial government)?

Also, Mr. Pigott does not indicate how Ontario should retain the services of these boys trained at their expense.

The federal government now makes large appropriations yearly for the Canadian militia, navy, and air force. Part of these appropriations are expended on educational institutions such as the Royal Military College, Naval College and Camp Borden. Would it not be desirable to expend a larger part of these appropriations to extend the educational idea to include apprentices for various trades?

By using these appropriations the fascination of a boy for soldiering, the sea or flying would induce many boys to learn a trade; means for paying the boy while learning would be provided and means of retaining his services, where trained, for a certain period would be provided.

Yours truly,
D. G. Joy.

The building activities in Woodstock more than doubled for the past 12 months as compared for the year previous. The 1922 total is $242,965, as compared with $114,593 for the year 1921. There have been no outstanding buildings erected during the year but the total was made up from new dwellings and additions.

Mount Royal is a Model Townsite

Home building has been very active in the model town established by the Canadian Northen Railway Co., and known as Mount Royal. This townsite has been carefully planned and the houses are substantially built. To indicate the nature of the development this article has been prepared.

The townsite of Mount Royal, P. Q., a suburb of Montreal, was one of the most active house building communities in Canada during the past year, a great number of high class dwellings, many of the duplex type, having been built in this comparatively new town. The Canadian Northern Railway Company was responsible for the establishment of this townsite, an actual start on the development being made on the completion of the company's tunnel through Mount Royal in 1918. The history of this community's development since that time is a particularly interesting one, in view of the rapidity with which this well-built district has sprung up, under the careful and efficient management of the company's officials. Mount Royal, commonly known as "the Model City," is an excellent example of the art of Town Planning. A brief review of the town's history, as supplied us by officials of the Canadian Northern Montreal Land Company, Ltd., who have charge of the development, follows:

When the Canadian Northern Railway arranged to obtain access to the centre of Montreal by cutting a tunnel through "Mount Royal," they found it necessary to acquire a large tract of land on the Northern slopes of the mountain to give them access for their tunnel, for power stations, etc. The idea was then conceived of establishing a new residential suburb for Montreal immediately at the tunnel portal. For this purpose approximately 1,700 acres of farm lands were purchased and laid out as a townsite. Application was made to the provincial government for the incorporation of this territory into a separate municipality and a charter was granted authorizing the formation of the incorporated town of Mount Royal.

Planned on Garden City Lines

The townsite was plotted on garden city lines with the main arteries radiating from the centre of the town, 80 ft. in width, and all other streets 66 ft. wide. In 1918, when the tunnel was completed for traffic, development of the town was actively commenced. Sewers and water services were installed and roads and sidewalks built to permit of building operations. During 1918 and 1919 the first houses were erected, but owing to war conditions only 21 houses were built at the end of the latter year. In May 1920, however, 54 new houses were contracted for and completed during that year and the early part of 1921. These were all detached or semi-detached superior types of dwellings, costing $8,000 to $13,000 each. All were of heavy construction—12 inch to 14 inch concrete foundations—with outer walls either

Typical dwellings in the C.N.R.'s model city of Mount Royal of 12 inch solid brick, or of 8 inch concrete "breeze" block inside with 4 inches of brick outside. All of these houses had slate roofs and hardwood finished interiors.

In 1921, to meet the demand for houses of a cheaper type, application was made to the Quebec Government for a grant of the Federal Housing loan. Two hundred thousand dollars was allocated to the town. A special housing company, called the Rockland Housing Company, Limited, was incorporated, and in November, 1921, the first of 16 houses was started, for spring occupation. These houses were built in pairs, each one containing either six or seven rooms, i.e., living-room, dining-room and kitchen downstairs, with 3 or 4 bedrooms and tiled bathroom upstairs. All had concrete foundations, walls built with 4 inch brick outside and 6 inch concrete "breeze" blocks inside, furred and lathed and plastered, cottage roofs of asphalt shingles. Each residence has a large attic. They were sold at $6,250 and $7,000 each, respectively, and such was the demand that all were snapped up long before completion. A further 36 were started in April, were sold, completed and occupied by the 1st of October last year. Some of these latter houses were improved by slate roofs and in other ways, and the prices varied from $6,500 to $8,300 each.

A further grant of $200,000 was obtained from the provincial government and a contract given for 52 new houses of a similar kind, to be delivered by the 1st of May this year. These are now all roofed and well on towards completion and, as a matter of fact, 39 are already sold and the balance practically booked for sale.

Houses are Standard in Size

The whole of the Rockland Housing Company's houses are of standard sizes, about 5 foundation designs being followed, but elevation plans have been modified and altered so that monotony of appearance is avoided and quite a variety of interior changes have been made possible. In nearly all of these houses B.C. fir has been used for trim with birch floors. It has been possible in most cases to follow the taste of the different purchasers as to interior staining and painting and the result has been to furnish a standard house with individual and personal touches, making a charming result.

It may be remarked that as none of the houses are rented, but are occupied by their owners, who have an instinctive desire to improve their homes, wonderful progress has been made in the short period of occupation in laying out gardens and lawns and adding the "home touch" to the new houses.

Simultaneously with the building of homes other construction has proceeded—a $50,000 fireproof Protestant school was erected in 1921. A municipal fire station and garage was completed last year, also a large recreation and social hall. A Catholic school is now in course of erection and will be completed by next March. Two stores, with dwellings above, have been finished during the past year also, valued at $14,000 and $15,000 each.

Transit facilities are given by the C.N.R. electric trains which reach the centre of the town in eight minutes from Montreal and street car lines run to within a few blocks of the south-eastern section of the property.

Locally the town of Mount Royal is more familiarly known as "The Model City," presumably on account of its excellent lay-out and building restrictions. The lots vary from 30 ft. in width to 60 ft. and average 100 ft. in depth. Only detached or semi-detached houses are permitted in the residential sections, and the walls of buildings cannot be built within 5 ft. of the lot line, consequently no solid terraces of dwellings are possible. Stores, flats and apartment houses are permitted only on certain main roads. Illustrations of a few representative types of houses are shown herewith.

Machinery & Equipment

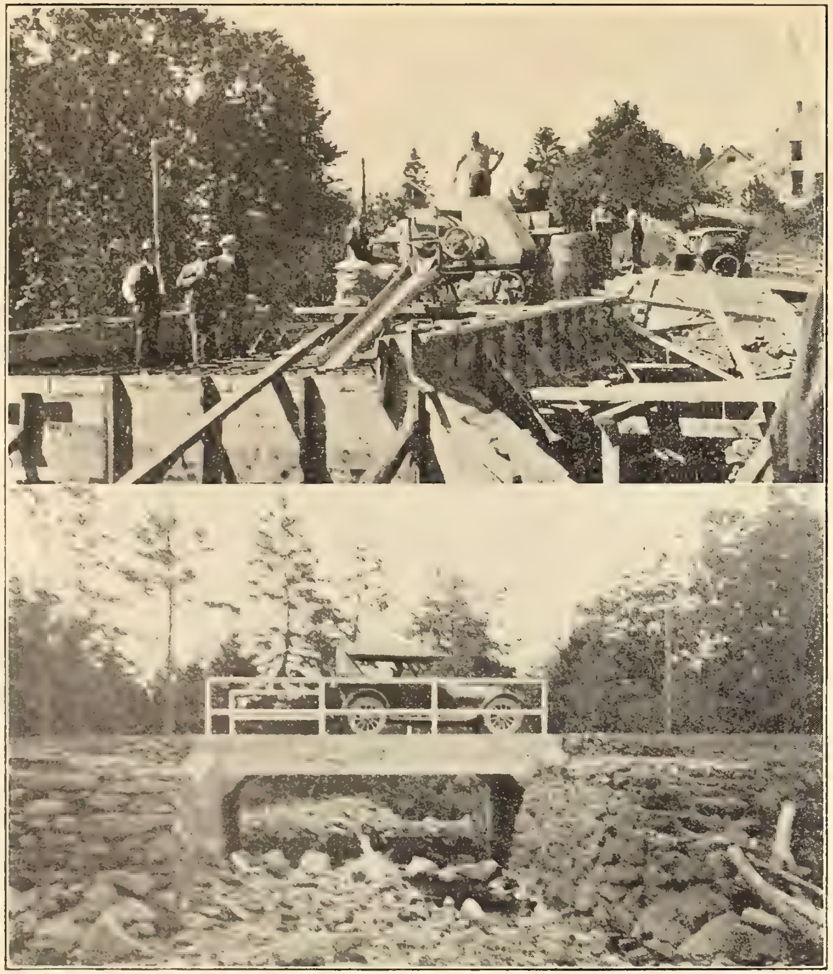
A New Small Hand Pump

A small hand oil pump for use in factories and garages is being placed on the market by The Smart-Turner Machine Co. Ltd., Hamilton, Ont. In the illustration it is shown attached to one of their steel barrels, but it may be used in any barrel, either wood or steel. The suction pipe is provided with a screwed bushing, with 1½" pipe thread, which screws into the bung hole of the barrel. There are two adjustable stops on the pump, so that it can be set to pump any desired quantity up to one quart. There is also a lock and key provided, so that the apparatus can be locked up when not in use. The discharge connection is arranged so that a hose may be attached if desired. The pump is suitable for handling oil, gasoline, syrup, molasses, etc.

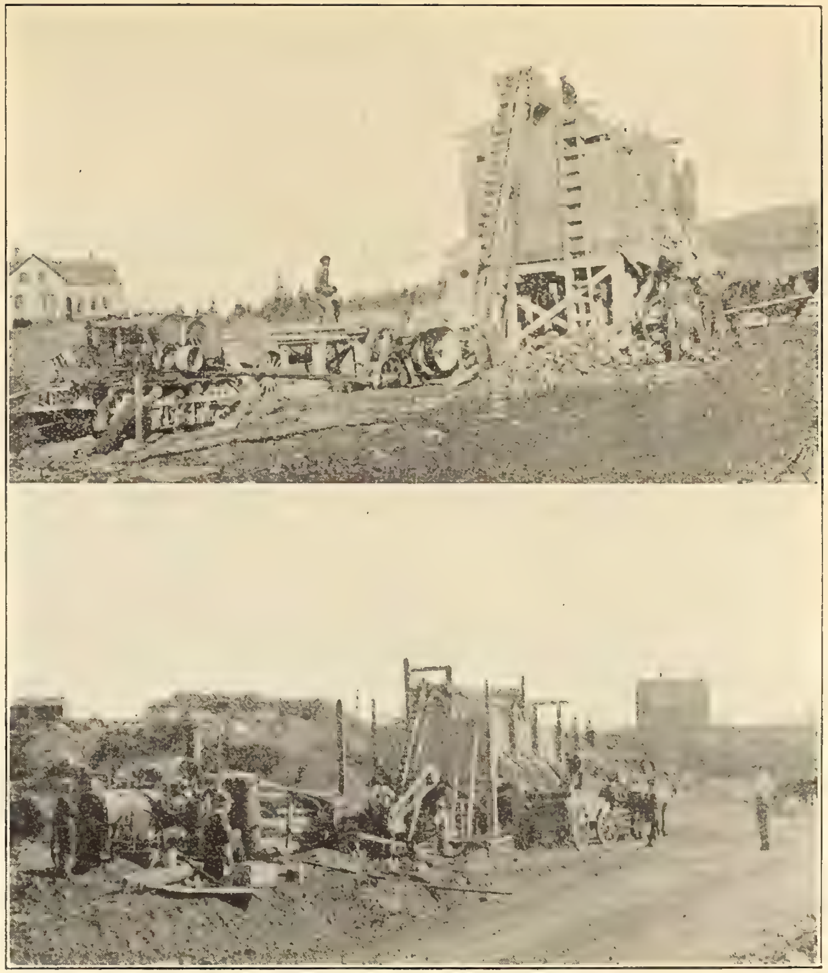
Fort William Building Permits

At Fort William building permits for the year 1922 amounted to $1,446,685, this being an increase of 40 per cent. over the figures of 1921.

HIGHWAY ACTIVITY IN NOVA SCOTIA



DIGBY—ROSSWAY ROAD
Dominion aid road construction; macadam road; Top View; Post Brook Bridge, under construction. Bottom View: Post Brook Bridge, completed



MONASTERY—MULGRAVE ROAD
Dominion aid road construction; macadam. Top View: Showing crusher plant, Monastery section, day labour. Bottom View: Showing crusher plant, Mulgrave section.

Construction Activity Is on a Rising Wave

By MacLean Building Reports Ltd.

The figures for 1922 show total construction undertaken to a value of $331,843,800 compared with $240,133,300 in 1921. Even in 1920—a year of feverish expansion and inflated costs—the monetary value of new building was seventy-five millions less than last year. In actual volume of work performed the 1922 total may be placed 70 per cent. above that of 1920, due allowance being made for the lower present scale of costs. Going further back, the figures for 1917, 1918, and 1919 at $87,298,062, $99,842,300, and $189,821,300 respectively, look insignificant in comparison. Indeed not since the pre-war period, when for three years (1911-13) the whole country enjoyed a phase of unwonted prosperity and development, has any aggregate been recorded to equal that of last year.

On a Rising Wave

The three years, 1911 to 1913 are worthy of brief pause, in that they present an interesting example of a full cycle of expansion and deflation, the peak of which was reached in the record year 1912, when contracts reached the $476,394,523 mark, this in turn being followed by a leaner year (1913 $395,282,294). The year 1922 may well represent the rising tide of a similar cycle. But a scrutiny of the quarterly figures suggests that the wave has by no means reached its crest. For the final quarter which usually returns a small total, owing to obvious weather disadvantages, measured well up to the midsummer figures, betokening still better things to come. In detail the statistics show:

Quarter	Contracts Awarded
Jan.-March	$ 33,575,900
April-June	105,876,100
July-Sept.	91,195,200
Oct.-Dec.	101,196,600

And to cap the climax, the month of December, just ended, gave birth to $52,472,400 of fresh projects, this being the largest monthly aggregate since April, 1913, and one which has been exceeded only three times in the annals of Canadian building.

What accounts for this remarkable activity? Where, in a year of business and industrial inertia, does the impetus come from? A glance at the above figures draws attention to the importance latterly assumed by residential and engineering construction.

Attacking the Housing Problem

The steady increase in residential building, which took precedence to all other categories until the final quarter of the year, was not unexpected. The actual extent of the advance, however, exceeded anticipations. The above table reveals a seven-fold increment in the output of dwellings during the five years from 1918 onward. The explanation is not far to seek. During the war and for some time thereafter, this type of construction gave precedence to the more important demands of industrial expansion. A genuine shortage of homes developed, and was accentuated as building costs rose precipitously. Thousands of families "doubled up," or were forced into apartments or lodgings at exorbitant rentals. Consequently when in 1921 materials and labor costs began appreciably to fall, there was a pronounced rush to erect moderate priced dwellings. The movement spread as costs declined, till by the spring of 1922 the sound of hammer and trowel rang as never before on the suburban fringes, and whole new streets sprang up almost overnight in the larger Canadian cities.

Demand Still Unabated

Whether the aggressive assault made during the year on the housing problem has taken much of the edge off demand is difficult to say. A year ago it was estimated upon reliable authority, that the actual shortage of homes in Canada, were people living according to pre-war standards of accommodation, was 165,000. During the year some 21,000 new houses were built. The potential demand would therefore appear to be little abated. Yet the above estimate of 165,000 houses represents rather what the country would require if it could finance its full needs. It is not the "effective demand." The latter, however, has been sharpened by a psychological factor, namely the growing popular belief that building costs have now fallen to a point where prospective builders have little to gain by further delay. So important is this factor that it will not improbably assist in the production of even more houses in the coming year than in the past.

In passing it may be noted that the apartment house is losing in favor. Only 115 apartments were erected throughout Canada during the year, or roughly one apartment for every two hundred houses. Canada is thus maintaining its high proportion of home ownership, as most of the houses that have been built are for immediate sale to the ultimate occupants.

Big Engineering Projects Materialize

The advance made in engineering construction is the outstanding feature of the year. Projects undertaken in this department were double those of a year ago, and six times those of the last war year. Two species of undertaking predominate: road improvement in both rural and city communities, and hydro power development. The case of road building is similar to that of houses. Long arrears of work deferred during the war and after, are at last being taken up, as general financial conditions improve.

It speaks well for the confidence of Canadian business men that notwithstanding the unprofitable state of trade, more than eighty millions should have found its way into commercial premises and extensions. This, too, in spite of the fact that failures during the first quarter of 1922 were the heaviest ever known in Canada and the United States. With the coming of spring, however, business mortality waned, and at the present moment the outlook for business building is more hopeful than it has been for two years.

Industrial construction in 1922, just as in 1921, was light, though not altogether negligible. Not since 1918 has it enjoyed a premier place. As compared with 1921, however, it is possible to report an increase of 55 per cent. in the value of contracts awarded. In several basic industries, such as pulp and paper, and steel, where not a dollar's worth of expansion had been planned during the previous twelvemonth, important new work was executed. Industrial building is, of course, linked up intimately with the general trade revival; and with the latter at last assuming tangible form, the prospects of the former have recently visibly brightened.

Ontario Leads Province

Among the provinces, Ontario's total of $166,628,000 of new work stands out conspicuously, as being slightly greater than the aggregate for the whole of the remainder of the Dominion. The boom in house building was most pronounced here, claiming over $60,000,000, while public works absorbed an almost equal sum. Ontario's priority is of course largely due to the fund of accumulated wealth which it possesses, and which is available to draw upon for any urgent requirements, even in periods of depression.

Western Canada was the only territory to return a smaller total than in 1921. Earlier in the year high hopes were pinned on the outcome of a bumper crop. Produce prices proved disappointing, however, and the western farmer and tradesman are still battling against debt. Immigration, too, continues to be negligible. At $50,770,000, the year's returns from the four western provinces were 10 per cent. below 1921. Moreover, of this total British Columbia takes credit for the major share. Indeed it is only fair to make a distinction between the prairie districts, where there appears to be no immediate sign of enlivenment, and the Pacific Coast, along which building activity is developing encouragingly.

Large Advance in Quebec

Quebec, with $103,291,800, ranks second only to Ontario. Its advance of 65 per cent. over the previous year's showing is quite the largest made by any province, the gain for the year in Ontario being only 45 per cent. Residential and engineering work, especially the latter, were the strong groups in the Quebec classification also.

In the Maritime Provinces a slight improvement occurred in every type excepting industrial building.

Labor More Efficient

Two factors have contributed most to the year's very satisfactory showing, an improvement in the labor situation, and a much steadier tendency in material prices. With regard to the efficiency of labor it is impossible to offer any estimate which is strictly applicable to all sections of the country. In the Toronto district, however, to choose a typical example, the bigger contractors express fairly unanimous agreement with the statement that the productivity of labor, which two or three years ago was about 60 per cent. of the pre-war standard, rose during 1922 to 85 per cent.; some authorities say even 90 per cent. Inasmuch as the Toronto district yielded 13 per cent. of the whole Dominion's building total, this estimate is an important indicator of the efficiency of labor everywhere. In Montreal, on the other hand, it is claimed that the improvement is less marked. Montreal, incidentally, stands second among cities, accounting as it does for approximately 6 per cent. of the Dominion total.

British Columbia Faces a Prosperous Year

By B.C. Correspondent

Building activity in British Columbia up to the present time has been confined to home construction, but commencing this year larger projects will be started. Already this year the drawing of plans for over $5,000,000 worth of construction has been authorized, with the probability of this total reaching at least $20,000,000.

For example, the British Columbia Electric Railway Co. has authorized the expenditure of over $1,500,000 for construction purposes for the new year. This includes a high tension line to supply the Britannia Mining and Smelting Co., Ltd., with a 5,000 h.p. serivce. The new high tension line opens up considerable new territory not yet served by central station lines; notably, the municipality of West Vancouver, with some 900 homes is the first district to be served.

Construction will start on grain elevators, a large flour mill, office buildings and several apartment blocks.

The Canadian Pacific Railway Company is opening a new tract of land for subdivision into building lots, and will offer long term payments on loans, for the erection of medium priced homes.

Contractors Favour Derrick Inspection

A very representative gathering of trades affected by the proposal to inspect derricks, hoisting apparatus, etc., was held on the 10th, in the Builders' Exchange rooms, Toronto. Messrs. George Evans, R. McIntyre, Hepburn, and Reid, represented the steel erectors, and Messrs. Oakley, Vokes, Webb, Witchall, and John V. Gray the contractors.

The feeling of the meeting was against the permit system which was thought to be unnecessary and causing a waste of time. Regarding the inspection all were agreeable, especially so if the inspection was carried out by a capable man and was of the same character as the present scaffold inspection.

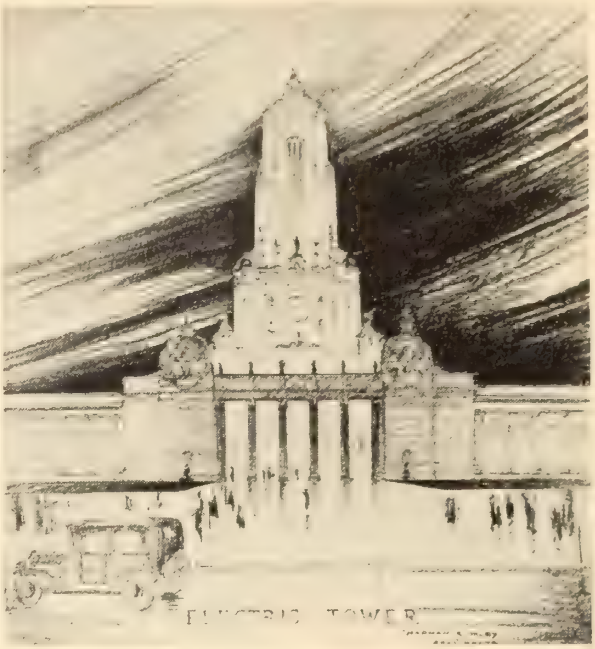
The secretary was instructed to procure data as to what system of inspection was being made in other cities, so as to present a tangible plan to the city building department at the next meeting of the Exchange and the department.

Shingle Nails are Tested at Government Laboratory

Few people associate the word "research" with such ordinary things as nails, but it is declared by the Forest Products Laboratories of Canada, Forestry Branch, Department of the Interior, that carefully conducted experiments are having an influence on the manufacture of such articles. The selection of the most suitable nail for fixing shingles is likely to be determined by tests made at the Laboratories at Montreal to find the holding power and rust-resisting qualities of different types of shingle nails on the market. One of the most promising appears to be a Canadian-made cut nail which held more firmly than any other and had a better galvanized coating. These nails were cheaper per barrel than imported nails, but as each nail contained a little more metal the number per barrel was somewhat smaller. The work of testing nails might seem outside the scope of the Forest Products Laboratories of Canada, but it is a natural sequel to their series of tests on the nail-holding qualities of Canadian woods.

Car Shops Costing $1,250,000

The contract for the construction of the new street railway shops for the Toronto Transportation Commission has been awarded to the John V. Gray Construction Co. Ltd., Toronto. The work will involve an outlay of at least a million and a quarter dollars.



New Buildings Planned for Canadian National Exhibition

The directors of the Canadian National Exhibition, Toronto, are making preparations for the erection of a number of new buildings to meet the demands of exhibitors. Among those the Electrical Building will be one of the most prominent.

In the present issue we are reproducing a number of plans indicating more fully just what the proposition means.

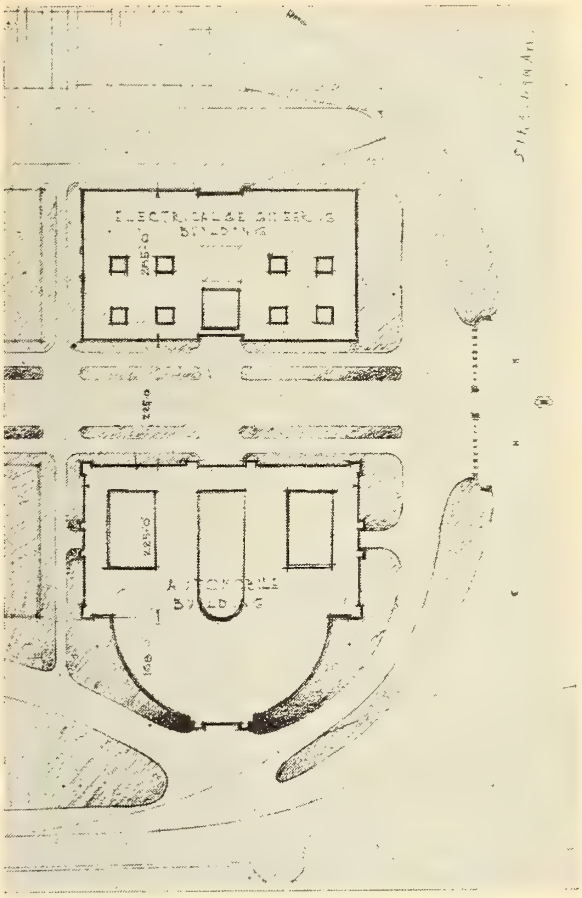
It will be seen that the future plans of the Canadian National Exhibition are for an extension eastward to Strachan Avenue, with a very attractive entrance at that point, which, they propose, will become the main entrance of the exhibition grounds. Immediately on entering the grounds through this eastern gateway, the two buildings which will confront visitors to the Exhibition are the Automobile Building and the Electrical Building. The committee in charge of the negotiations consider this location of the Electrical Building a particularly happy one, not only on account of its proximity to the main entrance, but also because it stands immediately opposite the Automobile Building, which, may perhaps be considered today as attracting the most visitors of all the exhibits on the grounds. A detailed description of the Electrical Building itself which, studied in conjunction wtih the illustrations reproduced, will give our readers an accurate idea of the magnificence of the whole conception, is printed below.

General Description

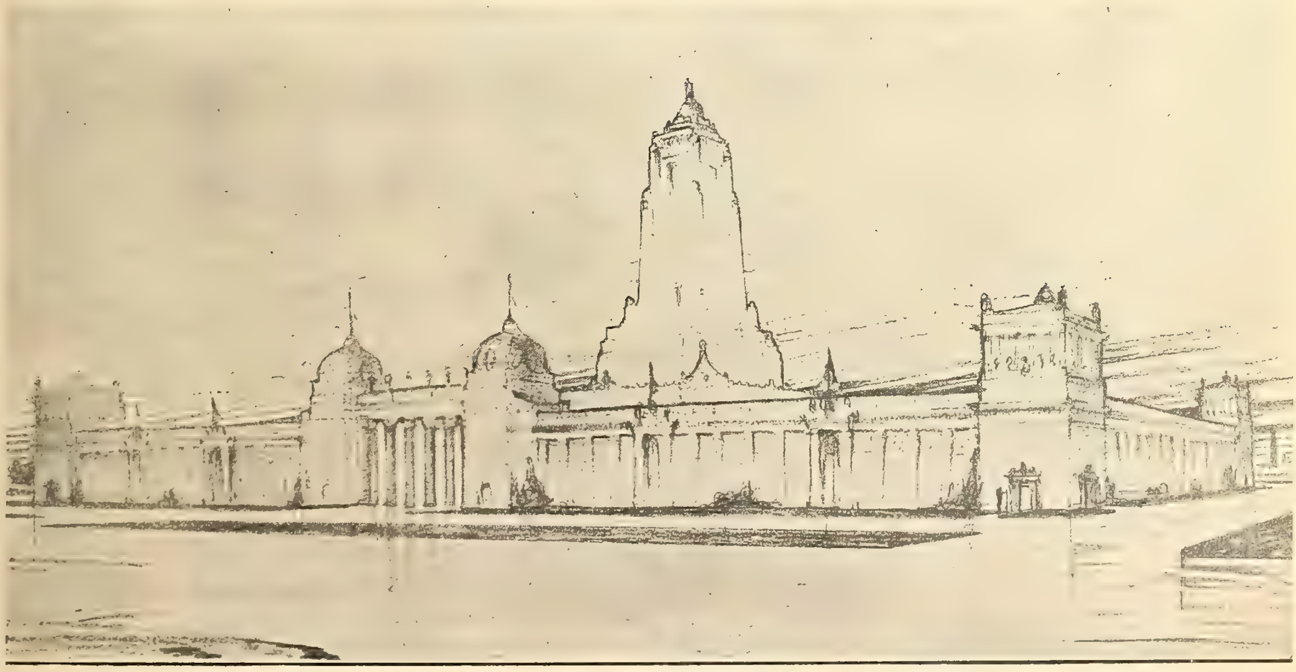
The electrical building will be at the eastern end of the exhibition grounds so that it will, together with the proposed new automobile building, form a monumental entrance feature to the whole grounds. The main approach to the grounds will then be by a plaza 225 feet wide by about 1,300 feet long starting at the line of Strachan Avenue extension and stretching westerly to an open place in front of the arena. The Electrical and Engineering Building will flank this entrance way on the north and the automobile building on the south. The Electrical and Engineering Building is about 460 feet long and 290 feet wide with small entrances at the four corners and large central entrances at the south and north, and the whole composition will be dominated by a monumental central tower. The walls will be designed in a character and scale suitable to the magnitude and dignity of the whole group and will be executed in a light colored material with certain features emphasized in colored cement to give a note of gaiety and richness.

The southern section of the building, comprising an exhibit area of 42,000 square feet, being 460 feet long by 190 feet wide, will be devoted to smaller electrical exhibits and a theatre—mentioned later. The ceiling will be about 18 feet high and there will be no windows for light on the exterior walls owing to the nature of the exhibits. Ventilation will, however, be obtained by means of eight small courts from which the daylight may be obscured if found desirable on account of electric lighting exhibits. The exhibit booths are mostly 16 ft. deep, but there are a few that are 12 feet deep; the width of the corridors varies from 12 to 18 feet.

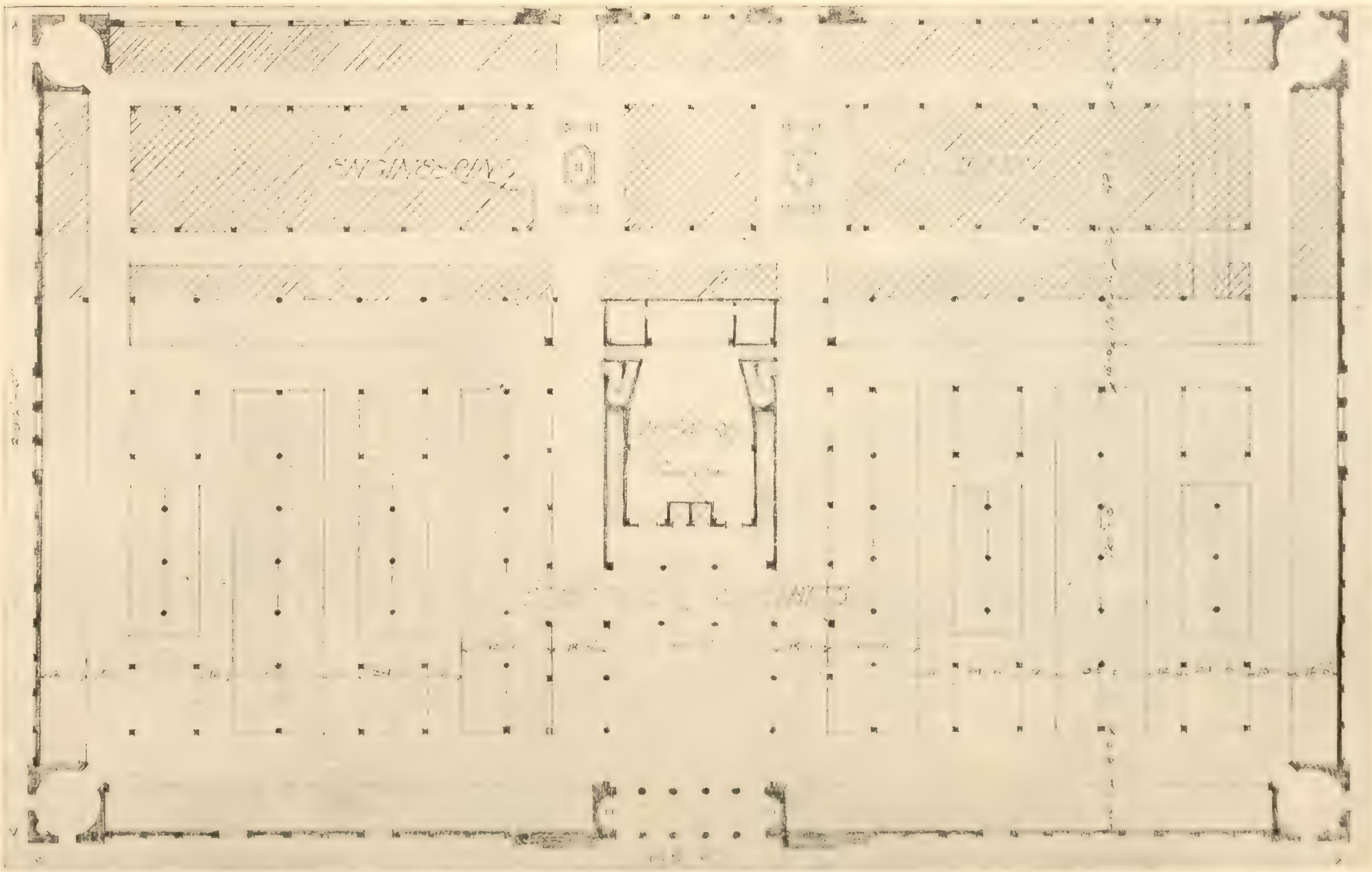
The tower faces the main entrance court with the elevators, stairs, etc., giving access to the upper storeys. A demonstration theatre with a seating capacity for 400 people is under the tower on the main floor. The base of the tower is 100 feet by 100 feet, and in the centre of the first storey the basement of an "Electric Home" is situated together with 2,416 square feet of additional exhibit space for those electrical exhibits associated with the basement of a house. The circulation would be guided around the Home first, then around the other exhibits and then up to the next storey to the main floor of the Electric Home, which is also surrounded by 2,496 square feet of additional



The new main entrance will extend east to Strachan Avenue. On the left of the visitor as he enters (walking west) will be the automotive building and, on the right, the Electrical Building.



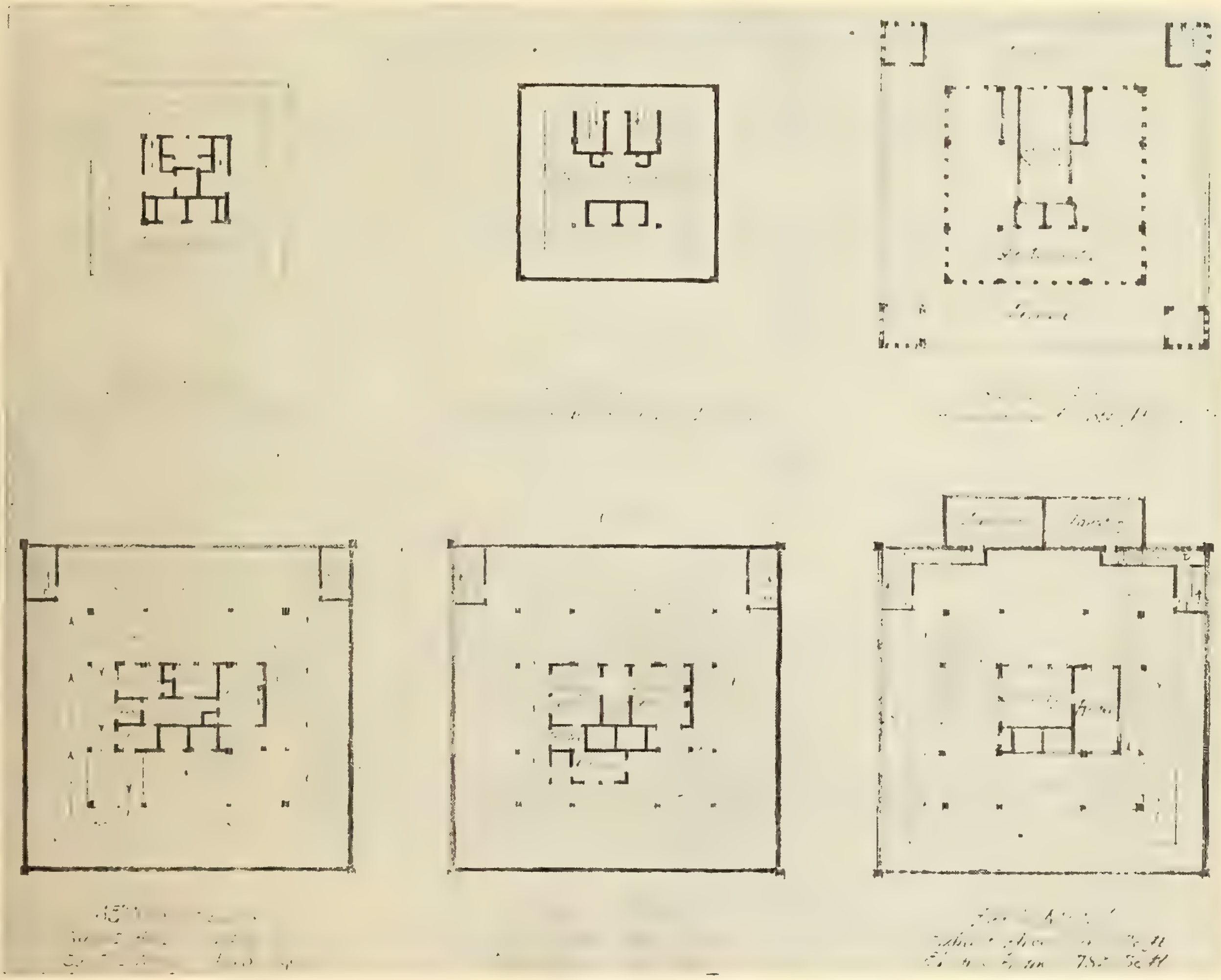
Main entrance and general southern aspect of proposed Electrical Building.



Plan of proposed Electrical Building—Main entrance on South with supplementary entrances and exits at each corner—Theatre shown in centre is in base of seven storey tower, which dominates the grounds—The rear of the building will be occupied, temporarily at least, by the heavier types of machinery—The eight square spaces, four on each side, are light wells which, in the floor areas, will have horticultural treatment.

exhibit space. The next floor contains the bedroom floor of the Electric Home with 2,496 square feet of additional exhibit area.

Above this is the roof of the base of the tower 56 feet above the ground, from which the tower rises to a height of about 180 feet above the ground. This roof space around the tower and under the tower is utilized for an electrical restaurant with accommodation for about 350 people. The floor above this in the tower proper has an electrical kitchen from which dumb waiters would serve down to the restaurant and up to the Tea Garden above. This kitchen would be used as an exhibit of electrical restaurant equipment with circulation around it for the public. The tea garden above will have accommodation for 120 people and at this floor the main elevator service will stop, but there will be an elevator that people will transfer to, taking them to the top of the tower, from which a magnificent and comprehensive view of the grounds and city could be obtained.



The tower will contain an Electric Home—First floor up will consist of a house Basement—Second floor up Dining Room, Kitchen, etc.—Third floor, bedrooms etc.—Fourth floor up will be an Electric Restaurant—Fifth floor, an Electric Kitchen—Sixth floor, an Electric Tea Garden. A few feet of space around the outside of each flat will be available for the display of electrical appliances.

The northern portion of the building will be devoted to heavier engineering exhibits; the dimensions of this section will be 460 feet by 100 feet. A double railway siding will enter the building at the east end from which a travelling crane will pick up the exhibits from the cars and carry them, if necessary, the full length of the building. The exhibit area in this section is 28,640 square feet, the booths being 12, 16, and 24 feet in depth, and so arranged that an exhibitor can take a double section thereby obtaining an exhibit space 48 feet deep. The aisles vary from 12 to 15 feet in width. This part of the building, in contrast with the purely electrical part, has provision for ample daylight from clear stories and the north wall, which is nearly all glass, to produce that machine shop effect which is associated with large machinery.

The Use of Grout in Cut-off Trenches and Concrete Core Walls for Earthen Embankments

By H. J. F. GOURLAY*

A careful examination of the description of recent water schemes in which extensive grouting has been carried out leads to the conclusion that our present methods might well be reconsidered, with the view to reduce the cost of dam foundations and to save time without in any way sacrificing watertightness or stability.

In many earthen embankments the cut-off trench has been carried to great depths in shales and stratified rocks, not for any other reason than to intercept and seal open joints and fissures, and in some cases it has been questionable whether a good degree of watertightness has been obtained, though it is true that any open fissures below the limits of depth of the trench are not likely to allow much leakage, since they will probably be small, and the water from the reservoir would have difficulty in obtaining access, especially after a few years of use and consequent deposition of fine silt over the bottom of the reservoir. There must, in most cases, be some measure of uncertainty as to whether the trench has really cut off all fissures, etc., likely to allow leakage.

To bring out the salient features of the grouting method the procedure and results obtained in two or three of several cases will be briefly described.

At the Lahontan earthen embankment, Nevada, constructed by the United States Reclamation Service in 1913 and subsequent years, the cut-off trench was excavated to a depth of 30 ft. through material which varied from an indurated, though sometimes soft, clay to sandstone, which, in places, was broken into small fragments, and in others formed massive blocks and with frequent fissures and joint planes from ¼ in to nothing in width. Vertical pipes, resting on the bottom of the trench, were built into the concrete at 3 ft. centres in two rows, about 2 ft. apart, and staggered so that there was a pipe every 18 in. Through these pipes 2½ in. holes were drilled. It was decided that the minimum depth of these holes should be 30 ft., and in some the depth drilled was 70 ft. Indication of the massiveness or otherwise of the rock was obtained from the cores, and on reaching and penetrating a short distance into a sound bed drilling stopped, and the rate of leakage of water under a head equivalent to the full reservoir (125 ft. of water) was determined and recorded for each hole; the pressure was kept on for ten minutes. The rate of leakage varied considerably from hole to hole.

The greater part of the grouting was done with a volumetric mixture of 1 part of cement to 7 or 8 parts of warm water—warm water being used to accelerate the setting of the grout—if, owing to the occurrence of a large seam or fissure the grout was found to get away too quickly the mixture was made richer, and in a few instances fine sand was added.

The pressure used in grouting was increased from 25 lb. per sq. in. as the operation progressed to a maximum of 100 lb. per sq. in. In some of the tighter holes the extreme pressure had to be kept on for at least an hour to drive the grout home, but usually a few minutes sufficed.

Drilling was not carried out at every pipe, but starting at a convenient low point alternate (or primary) holes in the upstream row were drilled, tested, and grouted. The intermediate (or secondary) holes in the same row were then drilled, tested, and grouted, and only in very few cases was it found necessary to deal with any of the holes in the downstream row.

Another United States reclamation dam, this time of masonry with a maximum height of 200 ft. above stream bed, has a grouted cut-off. In the Elephant Butte Dam the cut-off trench is of no great depth, but 4 in. iron pipes were set vertically at 10 ft. centres along the centre line of the cut-off trench and carried up about 20 ft.; above this the holes were formed with collapsible metal forms 6 in. in diameter; through these holes 2½ in. drills were operated to sink grouting holes 45 ft. into the underlying sandstone rock. About 10 ft. downstream of the line of grouting holes a series of drainage wells was formed of 8 ft. centres by collapsible forms and carried up to an inspection gallery, which also serves as a drainage gallery with an outlet culvert discharge above river level on the downstream face of the dam. From the roof of the inspection gallery these walls were carried up to the top of the dam and sealed with a concrete plug. This row of drainage wells was continued 45 ft. into the foundation rock by 6-in. drills, and provision was made for grouting any of these which should show excessive discharge. Another row of drainage wells was formed 5 ft. downstream of the first and staggered with reference to them, but these were continued, by drilling, only 5 ft. into the rock; they also discharged into the inspection gallery and continued up to the top of the dam.

Seepage loss measurements under gravity and pressure heads were made for each hole after washing out and again after grouting. The loss before grouting varied from 0.1 to 150 gallons an hour under gravity and from 3 to 192 gallons under 100 lb. per sq. in. After an average of 0.015 gallons per hour per hole under gravity and 1.5 gallons per hour under 100 lb. pressure was obtained. If the loss of 100 lb. pressure after grouting exceeded 3.0 gallons per hour, the hole was re-drilled and grouted again. The grout varied with the character of the hole—1 to 7, 2 to 7, and 3 to 7 mixture being used. Sand cement, which was used in the concrete of the dam, was used where possible, as it apparently set as well as portland cement, mixed and handled better in the machine, and was less liable to collect and choke either in the machine or in the hole before the fissures were all filled.

It was anticipated that there might be leakage into and through some of the deep drainage wells. Any well found to be discharging as the reservoir filled was plugged with a wooden stopper through which a 1½-in, pipe was carried, placed 6 in. below the floor of the gallery, and covered with cement mortar so that the discharge could be readily measured. Where the flow from a well was found to be excessive the well was grouted and the discharge again measured; if it was still high the hole was re-drilled and grouted again. As an example one well discharged 85 gallons a minute, and although the flow was quite clear, it was decided to grout. The hole was re-drilled to its original depth, and the discharge was 13 gallons per minute; the procedure was repeated a few weeks later, when the flow was reduced to 1.35 gallons, and in six months this naturally fell to 0.64 gallons. By grouting the few wells which called for attention the total quantity discharged into the drainage culvert from the foundation and the abutments was reduced from 120 gallons per minute to 58 gallons, which is a very small quantity for a dam 1,200 ft. in length and with 125 ft. of water in the reservoir.

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*Paper read at the Winter Meeting of the Institution of Water En-

An example or two from the Catskill scheme for the water supply of New York will suffice to show that with careful supervision grouting may be used with confidence to secure a watertight foundation.

In this scheme grout was used extensively, not only in dam foundations, but also for deep shafts and in pressure tunnels, and it is probably true to say that as far as the tunnels were concerned, it was only by using grout that the work in many parts was carried to a successful issue.

The Oliver Bridge Dam, the masonry portion of which has a maximum height of 210 ft. above stream bed, is about 1,200 ft. long. The bluestone layers below the stream were excavated to sound rock to about 25 ft. maximum depth, and the cut-off trench extended a further 15 ft. Below the top of the bluestone alternating layers of slate, shale, and bluestone were found in beds varying in thickness from 1 to 15 ft. Before the excavation for the dam was started diamond drill holes were made 40 to 100 ft. deep, and hydrostatic tests of these revealed two definite planes of leakage at depths of 40 to 60 ft. below stream bed. One row of holes at 5 ft. centres was drilled for sealing off the lower seam, and for the upper seam seven rows were drilled, giving holes 5 ft. apart every way. Into each hole a 3 ft. length of 2 in. wrought-iron pipe was driven; the lower end of the pipe was chipped with a chisel and served with jute, which formed a tight joint with the rock, and the pipe was sealed to the rock with cement grout or by caulking with neat cement. The pipes were added to as the concrete masonry rose by screwing on convenient lengths, until the rock had a sufficient weight of masonry—10 ft. or more—to prevent uplift during the grouting. The quantity of grout per hole varied from 9 to 200 cub. ft., and only about 10 per cent took any appreciable quantity. The maximum distance through which grout was forced, making its appearance in other pipes, was 70 ft.

As an experiment grout was forced, under a pressure of 25 lb. per sq. in., into a hole drilled 15 ft. back from the edge of the cut-off trench, and appeared on the face of the trench at a horizontal seam about 6 in. below the top. Several months later the rock covering was barred and wedged off, and the seam appeared to be well filled with cement which was set hard. From another experimental hole it was found that seams within a radius of 4 ft. were well filled with grout and partly filled for another 2 ft.

Two completed earthen embankments or dykes, with concrete core walls, closing gaps between the hills round the Ashokan reservoir, were found to be leaking below the core wall; the seepage in one was reduced 75 per cent, and in the other by 90 per cent, by drilling and grouting through the core wall and well into the foundation rock in the former case, and in the latter case by holes sunk upstream of the core wall into solid rock.

The foundation of the Kensico Dam was rendered tight by grouting the fissures, faults and bedding planes of the crystalline limestone, schist and gneiss on which it was built.

Grout may be used to secure a watertight cut-off in all materials except running sand. It has been used to solidify the sand through which one tunnel has been driven, but the experience there would hardly lead one to suggest grouting as the means of dealing with the sand in trenches. In most stratified material the quantity of cement required in grouting is not excessive; in gravels a considerable amount may be necessary, but even then it may be cheaper to grout than to deal with the large inflow of water which is so frequently found in gravel.

In much-fissured and jointed rock, such as may occur in some sandstones, grouting might be satisfactory, but a considerable quantity would be required, and it might be necessary to use a richer mixture with the addition of fine sand. It is very doubtful, however, whether, after such a structure was revealed by trial pits, or borings, the site would be considered at all suitable for a dam.

Concrete Core Walls

It sometimes happens that the character of a dam site precludes the use of a masonry structure, and calls for an earthen embankment, though there may be no suitable clay near at hand for the puddle wall. This means either that they must be brought from a distance, and consequently the puddle wall becomes very costly, or some other material must be used for the core wall either alone or with a much smaller thickness of clay.

Clay puddle is capable of adapting itself to any settlement which may take place in the bank, and also to any possible movement of the bank in an upstream or downstream direction under the influence of a changing reservoir level and consequent height of saturation in the upstream half of the bank.

No attempt has been made to formulate a method of calculating the thickness of a puddle core, nor does it seem possible to do so. Experience or precedent has been the guide, and this is expressed by a simple statement of the top width and the batter of the faces, usually with a reservation as to the ratio of the thickness at the base to the greatest height of the wall.

It has been laid down by some authorities that the above ratio shall not be less than 0.33; the top width has varied from 6 to 10 ft., and the batter from 1 in 8 to 1 in 15. The height of the dam and the character of the clay and of the embanking material must obviously influence the choice of the dimensions to be adopted.

With good quality clay and with selected material of a retentive character available for use on either side of the puddle core, the dimensions of the latter may be 6 ft. wide at the top with 1 in 12 batters on either face down to ground level, and it may rest upon some type of shoe formed in the concrete of the cut-off trench, which is widened to possibly 12 ft. near the top, or the puddle may be made to envelop a knife-edge formed in the concrete. With these dimensions a wall 120 ft. high will be 26 ft. thick at its base or 0.22 of its height.

To obtain a ratio of 0.33 the top width would have to be 10 ft. and the batters 1 in 8 for the 120 ft. wall.

As an average case it may be assumed that a top width of 8 ft. and 1 in 10 batters will give a suitable core.

Plain Concrete Core Walls

Plain concrete walls have been used extensively in both embankments made as they are usually made in this country, and also in those formed by the hydraulic fill process. In the early days of core walls they were built of rubble masonry, set frequently in natural cement—e.g., in the Boston embankment—and it is not surprising that, in many instances, so small a resistance to percolation was found by means of trial borings in the embankment.

Twenty years ago Mr. E. Sherman Gould wrote: "It is to be feared that in many cases the masonry centre walls of earth dams are built too light; they should be more than diaphragms; they should be walls in fact as well as in name. My own rule is to give the wall a bottom thickness equal to one-quarter the greatest depth of water in the reservoir, and to draw in by off-sets 2 ft. in every 10 ft. in height. I would never voluntarily reduce this thickness, although I might increase it, except to draw in more rapidly at the top in the case of a high wall." Clearly with portland cement concrete of greater strength and resistance to percolation, a smaller thickness would be sufficient, and more recent practice calls for considerably less material in the core wall.

Mr. Clemens Herschell states that a concrete core wall 4 to 5 ft. thick at its lower extremity, increasing to 8 ft. at original ground level and battering to 4 ft. thick at the top is suitable for first-class work, although such walls have been made 2 ft. thick throughout. He states that if such a wall should crack, by faults of construction, the crack would not enlarge should water reach it, and that it would be more likely to silt up. It is not clear to what height he would carry a wall of the dimensions given, though from the context one might infer 50 to 60 ft.

Mr. Wegmann designed the rubble masonry core wall for an earth bank, constructed as part of the New Croton Dam retaining 96 ft. of water with a top width of 6 ft., increasing to 15 ft. at ground level, 100 ft. below, and 18 ft. at 136 ft. below, thereafter remaining 18 ft. to the bottom of the cut-off trench.

In the Catskill works the core walls were of portland cement concrete, 4 ft. wide at the top and battered 1 in 20 on each side. At a depth of 120 ft. the thickness would be 16 ft., though these walls were not nearly that height. They were built in courses 6 ft. high and 75 ft. to 150 ft. long, corresponding to the amount of concrete which could be placed by a "Blondin," or from trucks running on the completed portion in an eight-hours' day. The cantilever form used in building these walls consisted simply of pairs of verticals 14 ft. by 8 in. by 3 in., spaced 1 in. apart, the pairs being at 4 ft. centres. On the top [illegible] ft. horizontal lagging 6 in. by 1¾ in. was nailed. The verticals were held in position by bolts embedded in the concrete and by wires Spanish-windlassed up to give the required width of wall. In each 6 ft. lift a pair of bolts were concreted, after which the form was moved upwards, the bolts fitting in the slot or space between the 8 in. by 3 in. uprights. The form was lined up by wedging the projecting ends of the verticals of the completed concrete, and by adjusting the twisted wire ties. The embankments were made by spreading and rolling to 4 in. layers on the water side of the bank and to 6 in. layers on the other side, the layers being slightly inclined towards the core wall.

A recent and authoritative handbook states that the top width of a concrete core wall should be 1½ to 3 ft., according to the importance of the dam, and that each face should batter 1 in 10 to 1 in 20. The thickness at the level below which the trench is filled solid with concrete should be one-eighth to one-sixth the maximum depth of water. The thickness must, however, continue to increase until a sound, though not necessarily watertight, foundation is reached.

Many hesitate to use a plain concrete core wall because of the fear that a settlement following the saturation of the upstream half of the embankment may cause the wall to move downstream slightly, and that this movement may lead to cracks. There may be this tendency, but it is doubtful if, with a bank constructed under proper supervision, any movement of the core would take place, and if it did the cracks would only be small and likely to close soon by hydration of the new concrete surfaces exposed to the water and by fine sediment carried into the crack. Contraction cracks may be obviated by vertical copper strip expansion joints, and such joints would probably serve also to meet any movement cracks.

Reinforced Concrete Core Walls

The type of construction which seems best to overcome most objections is a concrete wall of such thickness as to limit the initial percolation of water to a very small quantity and flexible enough to yield to any variation of loading, and so reinforced as to limit any cracks which may occur to the "hair" variety.

To obtain relative impermeability, a rich mixture and a graded gravel aggregate running from material to pass ¼ in. mesh to 2½ in. ring is best. The rate of percolation through a given thickness increases nearly uniformly as the pressure increases, and for the same pressure the falling off in flow as the thickness increases is probably much more rapid than the increase in thickness.

Mr. Baldwin Wiseman has shown how, with a 6 in. slab of concrete subjected to water pressure varying from 30 to 60 lb. per sq. in., the flow fell from 0.000398 gallons per sq. ft. per hour per lb. per sq. in. pressure to 0.0000028 gallons per sq. ft. per hour in 46 days for 4 : 1 crushed gravel ballast concrete 9 weeks old at the start of his experiments.

If, therefore, a reinforced concrete core wall 2 ft. thick at the top, increasing to 6 ft thick at the ground at the deepest section—120 ft.—is adopted, the average head of water would be 80 ft. = say 35 lb. per sq. in. To take a low estimate, assume that the flow is only reduced directly as the thickness is increased, then we should expect an initial flow of $35 \times .0004 \times \frac{0.5}{4.67} = .015$ gallons per sq. ft. per hour. To allow for the difference between laboratory conditions and those obtaining on works, take this rate to be 0.040 gallons; if, then, the reservoir could be filled in a few days instead of six months, the probable flow through the diaphragm would be 0.04 × 1100 × 80 = 3,500 gallons an hour; but nothing like this should occur since within a month the falling off in flow is about 98 per cent, and probably 50 to 80 gallons would be the actual result, and if no other influence came into play this might be expected eventually to become still less.

In the Cowlyd Waterworks a reinforced concrete core wall is used—as far as the author is aware—for the first time in England. This wall is 4 ft. 6 in. thick at the bottom of the cut-off trench, increasing to 6 ft. 6 in. at solid ground level; from this level the thickness decreases from 5 ft. 6 in. to 2 ft. 6 in. at top water level; it is reinforced with ½ in. diameter rods 2 ft. apart vertically and 4 ft. apart horizontally from 6 ft. below ground level to 6 ft. from the top of the wall, on both faces, with 4 in. cover and stirrup bars at 4 ft. each way. The maximum height of the wall above ground is 52 ft.

In the Dixville Dam the core wall is 36 in. thick at the deepest section, reducing to 10 in. at the top and reinforced with horizontal corrugated rods varying from 1 in. to ½ in. in diameter in a height of 70 ft. On the upstream side of the concrete wall is a clay gravel puddle wall 20 ft. thick at the base and 8 ft. at the top.

The core wall of the Morris dam could hardly be considered as of reinforced concrete, but its maximum dimensions are 2 ft. 5 in. thick at the top, increasing to 12 ft. at 92 ft. below, with one 1 in. square twisted rod 8 ft. long for each sq. ft. of stunt head area at each vertical construction joint.

The core wall of the hydraulic fill Triton Dam now under construction of the United States Reclamation Service is a concrete diaphragm tied well into bedrock on the base and sides of the canyon. Below the ground surface it is 5 ft. thick with no reinforcement. Above ground it is heavily reinforced (no details of reinforcement are available), and tapers from 5 ft. to 1 ft. in a maximum height of 230 ft., the maximum depth of the cut-off trench being an additional 100 ft. more or less. No expansion joints are provided.

Other Types of Core Wall

It may be of interest briefly to refer to two or three types which have come to the author's notice.

It was suggested twenty years ago that a watertight septum of asphalt might be introduced into a core wall formed of common brickwork, and that the brickwork itself might be set in some soft sort of asphalt. The brickwork would be 14 in. to 18 in. thick on either side of a cavity 1 to 2 in. thick to be filled with hot asphalt. The asphalt would be sufficiently plastic as not to crack under any slight movement, and the initial volatile constituents would be kept to a minimum consistent with the production of a mixture of the necessary plasticity. Being hermetically sealed, it is surmised that the asphalt would retain its initial characteristics, and, in support of the suggestion to use asphalt in this way, reference is made to its widespread adoption for rendering watertight subway tunnels and similar structures.

It was further suggested that increased stability might be obtained for this asphalt diaphragm against loads brought about during the construction of the embankment through unequal heights of filling on the two sides, by the addition of a dry rubble backing on the downstream side, and a concrete wall on the upstream side. This, of course, would add so considerably to the cost as to make it prohibitive.

The idea of using asphalt merits consideration: possibly the walls could be of comparatively thin concrete reinforced by vertical and horizontal rods, since their chief function is to form the cavity for the asphalt. If concrete were used, the groove need not be quite parallel, but in lifts of, say, 4 ft. taper from 2¼ to 1¾ in. in width to allow of the removal of a metal form. Such a construction compares very favourably with a solid reinforced concrete wall, the estimated cost being £36,500.

A proposal to use a cellular reinforced concrete core wall is mentioned. This would consist of two parallel walls a few feet apart, separated by vertical and horizontal concrete diaphragms. The upstream wall would have a very substantial foot keyed into rock or other impervious material. The downstream wall need not be keyed in, or, at most, but slightly. Drain pipes with open joints and of large capacity would be led from the core wall at frequent intervals out through the embankment, and discharge into channels on the downstream side; the joints would be cemented as the pipes approached the toe of the embankment to prevent clogging of penetrating roots. Any water which may find its way through the sub-material or through joints in the core wall, or from any source, would be intercepted by the hollow wall and drained away. A dry earth prism is secured for the downstream section of the dam. The hollow core will be well lit up from above and accessible by a permanent ladder way. Openings through the party wells at various levels would give access to all parts of both surfaces, and any leak may be located and remedied. This sounds an elaborate and expensive arrangement, but the accessibility for inspection and repair is a favourable and novel feature of the proposition.

In conclusion, the author would quote the late Mr. James Mansergh, who, in his presidential address to the Institution of Civil Engineers in 1900, said:—"There is great comfort in building a dam in masonry as compared with an earth bank, but we should not allow fashion to run away with us and so build in stone, when earth and puddle would answer the purpose equally well at much less cost."

The cost of carrying out public works at the present time is so high that no avenue by which costs can be reduced without sacrificing essential stability should be left unexplored and undiscussed. Novelty in itself is not a sufficient ground for rejection, and while it is comforting always to be in a position to cite a precedent, new ground must be broken some time; and if, before some new process or modification of an existing process is actually put into operation, the scheme may be discussed on its merits, no harm and much good may result.

Plans for Bridge from Montreal to the South Shore Are Complete

It is announced that the plans for the erection of the proposed bridge between the city of Montreal and the South shore, are now ready for consideration by the Minister of Marine. The necessary expenditure for the preparation of the said plans was authorized last winter. It is expected that the Montreal Harbor Commission will spend the $10,000,000 required for the construction of the proposed bridge which would run from the foot of McGill Street to the South Shore through Ile Ste. Helene.

Practical Operation of Mechanical Filters

Simple Laboratory Tests are of Great Value in the Efficient Operation of Filter Plants—How a Small Town Water Works is Handled Successfully

By P. G. TURNER*
Filter Plant Operator, Wilson, N.C.

I find in my experience that I cannot efficiently operate my filters without making the required tests at least for tastes and odors, turbidity, alkalinity, free alum, free chlorine, and the jar tests for the proper dosage of chemicals. The color is not so important in the case of our water, but I consider the remaining tests necessary in order to keep well informed on the condition of the raw and filtered water. In making these tests care must be observed in order to insure accurate results. The apparatus must be clean and I use care in measuring samples to obtain the exact amounts required, as well as in reading the burette.

Determination of Alkalinity

The determination of alkalinity is absolutely necessary to find out how much alkali is in the raw water so that the application of chemicals can be accurately adjusted and to check this application by knowing the excess of alkali in the finished water. This excess I try to keep around 8 to 12 parts per million. I prefer to use the "erythrosine" method for alkalinity. An accurate knowledge of the amount of turbidity in the raw and finished water is also of first importance, on the raw water because it indicates the treatment required, and on the filtered water as a simple index of the efficiency secured. Turbidity is measured by a rod test, the candle turbidmeter or bottle standards. As the third method seems more satisfactory for the rather low, finely divided turbidities such as found in our raw water, I prefer to see this. A gram of standard Fuller's earth is suspended in 1 liter of distilled water and forms the standard of 1,000. By diluting this standard turbidities of any degree can be made. These are kept in tightly sealed bottles and the samples to be tested, contained in similar bottles, are compared with the standards.

A third test I find most useful is the jar test for determining the amount of alum and lime required to most effectively and economically dose the water. This consists of a series of glass jars or little miniature coagulating basins as I call them. These hold a quart of raw water. In connection with these are some solutions of the alum and alkali used at the plant, made up to known strength. The solution of alum I use is such that one cubic centimeter put in a jar of water will correspond to ½ grain per gallon. The alkali solution is similarly made so that 1 cubic centimeter to a jar of water will correspond to 2 parts per million alkalinity. With this outfit any combination of chemicals can be tried on the raw water, by adding solutions to the jars of water and stirring vigorously with a glass rod.

Without these tests I would not be able to intelligently operate my filters, as they allow me to determine the proper amount of alum and soda ash necessary to get the proper size "floc" or coagulant, thereby allowing me to do 75 to 90 per cent of my purification in my coagulating basin. By so doing it relieves my filters of a lot of unnecessary work, and the saving of chemical and thousands of gallons of wash water. I attribute the excellent condition of our filter beds to this careful adjustment of coagulant, together with an excellent wash system.

Adjustment of Chemical Dosage

In order to adjust my chemical dosage properly I find it necessary to have some means of measuring the raw water pumpage accurately. This is best done by a meter on the raw water discharge line, but we do not have this on our plant. However, each of our filter units is equipped with Builders' Iron Foundry rate-of-flow gauges, recording the rates through each unit. An integrating attachment gives the total water passed for any period of time. Whatever the device used, its accuracy should be tested at intervals. In the case of our plant I find that this can be done by dosing the influent valve to the filter and measuring the drop in water level for one minute. The area of the filter in square feet multiplied by 0.625 times the drop in inches gives the gallons per minute through the filter. Knowing in this way the exact amount of water to be treated the second important thing is exact measurement of chemicals to apply to the water. All chemicals should be carefully weighed on suitable scales, and added to known quantities of water in the solution tanks. In making up solutions it is highly important that these should be thoroughly stirred or else the solution will be stronger at bottom of the tank than at the top. This is done at Wilson with power driven agitators. After the solutions are made the important thing is absolutely even application of it to the water. This is the operator's most important task and he should keep his feed under constant supervision and at frequent intervals see that there is no clogging of the feed devices and that the flow is constant and uniform.

Cleaning Coagulation Basin

The coagulation basin needs little attention from the operator, except to clean it out as soon as too much settled material collects in it. We find it necessary to clear the Wilson basin every month. The proper time for cleaning is apparent when settled coagulant begins to stir up and comes over on the filters. Cleaning too frequently makes a useless waste of water and considerable labor expense. At Wilson we have an electric alarm system on our basin and chemical solution tanks and find it very satisfactory. This often saves considerable waste of chemicals and coagulated water besides preventing damage from the overflowing water to the plant equipment. The arrangement is simply a float in the basins and tanks which will close a circuit and ring a fill in the filter house when the level reaches a predetermined height.

Chief Points in Caring for Filter

In caring for the filters the chief points to be investigated are:

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*Presented at the annual meeting of the North Carolina branch of the American Water Works Association.

1. The condition of sand and gravel.
2. The rate of washing.
3. The rate of filtration.
4. The operation of the effluent controller.

I make weekly examinations of each unit to see that the beds are in proper shape. Daily I examine the sand by running a pole through beds while washing to be sure that there are no lumps or mud cakes. I also catch a sample of water going over the wash water troughs to see if any sand is being washed out. I examine my rate controllers each week, preferably just before washing and calibrate them occasionally to see that they are correctly set. To do this I close the influent valve and note the fall in water level over the whole area of the filter bed and calculate as previously described the rate of filtration in gallons per minute. I then compare this with the setting of the controllers and correct accordingly. I repeat this for various rates and for each filter unit. I check the regulation of the controllers by noting the rate as above, with different heads over the filter sand or vary the head by throttling the effluent valve. Our units all have Builders' Iron Foundry controllers.

Washing the Filters

In washing my filters I am guided entirely by my loss-of-head gauges, with which each unit is equipped and I consider this the only accurate and intelligent way to wash. These measure the friction loss through the matter, sand, gravel and underdrainage system and when operating properly are an index to the load distributor among the filters. When the loss-of-head increases to 7 or 8 ft. greater than the initial loss-of-head or loss-of-head obtained when the filter is first put into commission after washing, that I find is the proper time to wash. It is at this point I have found on my filters, that the controllers are wide open. As the loss-of-head will increase fairly uniformly for all units in service running at same rate, if any unit shows an excessive loss-of-head as compared with the rest, under normal operating conditions, I know there is something wrong with the gravel or strainer system. It is either clogged or otherwise obstructed. Such unit is immediately thrown out and investigated. We have a sampling cock on the effluent from each unit and at frequent intervals samples are taken for turbidity test and any filter showing an inferior effluent is always shut down until the trouble can be located and repaired.

The wash water at Wilson is furnished from a special wash tank that is calculated to give exactly 24 in. vertical rise on the filters. This has been shown to be satisfactory and I have tested it by washing the filter thoroughly clean and with different openings of wash valve I collected samples of water from the wash troughs in glass jars to see if any sand appears. The highest showing no sand is the rate used. We have a pressure gauge on our wash line as it enters the filters which furnishes a constant and convenient check on wash water. Occasionally, however, I check the wash rate by running the water level in filters below troughs, and opening wash valve with all other valves closed. The vertical rise can thus be easily determined with watch and rule.

I wash until the heavy dirt is removed, but not until the filter is perfectly clean as I prefer to have a film of coagulant jelly about ¼ in. thick over the entire sand surface to form a matte when starting the filters, and to wash beyond a certain stage requires an excessive amount of wash water. Our total time for washing is about 4 to 7 minutes, depending upon the condition of the raw water, length of run, etc., and we normally get 24-28 hours' run between washings.

The beds are carefully observed during washing and isolated mud patches suggest stopped-up strainers, especially if the sand beneath is not clean. Crates of sand are signs of water channels due to stratification, broken strainers.

I find that it is very important that the wash water valve should be opened and especially closed very slowly, as this has the effect of leaving the sand stratified, horizontally in layers of increasing fineness upward and in the best condition for filtering.

I find it not best to wash all filters in succession, but rather to so manipulate the washing that the time for washing the several units is divided proportionately among the shifts. This tends towards greater uniformity of the effluent and causes less unbalancing of operating conditions.

In a small plant like ours, say of 4 units, washing one filter unit throws 30 to 50 per cent more water into each of the others, which may disturb their operation, especially with a small coagulating basin or poorly regulated controllers. Our filters have been running for three years and I find that the wash water rise is exactly the same for same valve opening as when the plant was first built, showing that the underdrainage system and beds are in perfect condition and I have never had mud balls. I attribute this good condition entirely to extreme care in washing and in looking out for the beds.

When a filter is operating silt and coagulum are continuously collecting in the upper part of the sand, causing an increasing resistance to the passage of water, until a point is reached at which the pressure of water is above the sand is not sufficient to force the rated quantity through the filter. A vacuum is then formed below the sand surface, as the water is running through the lower part of the sand faster than it can pass through the clogged upper portion under the water head alone and this vacuum aids in keeping the filter up to its capacity. This decrease, however, in pressure causes dissolved gases to come out of solution and collect at point of maximum vacuum, forming a film of gas across the filter which effectively stops the passage of water and makes the filter air bound. This gas is partly air and partly carbonic acid gas. If the effluent valve is closed the gas will rise to the surface in large bubbles, breaking up the matte and forming passages through the sand. In a case of this kind I wash my filter before placing it into service again, as the matte has been broken and I could not possibly get a good effluent.

Chlorination

I find that chlorine is a much better germicide than hypochlorite of lime as the latter will lose its strength when coming in contact with the air. We also find that water treated with hypochlorite very often has an unpleasant taste, suggestive of iodoform. I do not know the cause of this, but probably the action of hypochlorite on organic matter is partially accountable for it, since the pumpage varies and rate of hypochlorite solution is uniform, but not so the liquid chlorine, the convenience and simplicity of operation as compared to hypochlorite being obvious. There is also no annoyance from dust or fumes with the liquid chlorine.

The Contract Record's

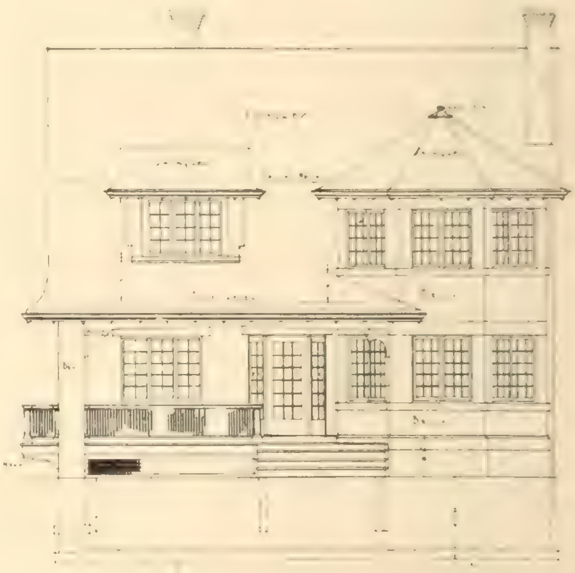
Weekly House Suggestion No. 53

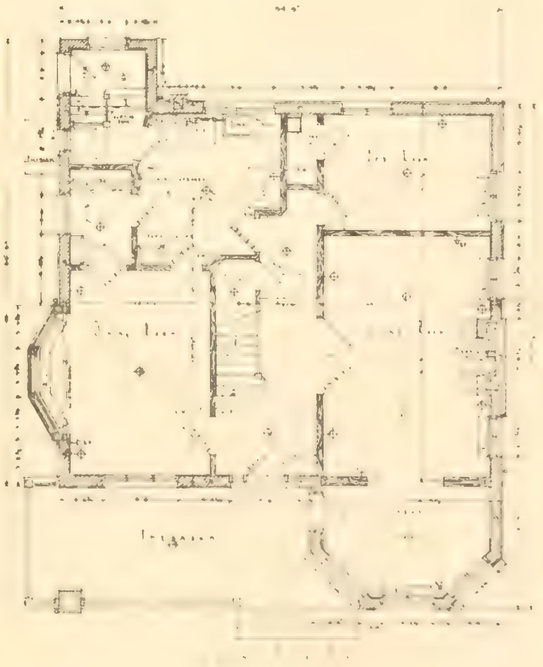
The plans of the residence we are illustrating this week are so complete in construction detail that they require very little, if any, comment. This subject is an excellent example of the ever-popular square-plan home, with the added feature of a library extension at the front on the ground floor, with separate entrance from the verandah. The rooms are all large and well laid out, with provision for an extra bedroom on the ground floor in addition to the usual living room, dining room and kitchen space. The kitchen and pantry arrangement has been well planned in this house and each of these rooms has direct connection with the dining rom through swinging doors. The many built-in service features in these two rooms are indicated in the plans. There are oak floors throughout and the trim is birch.

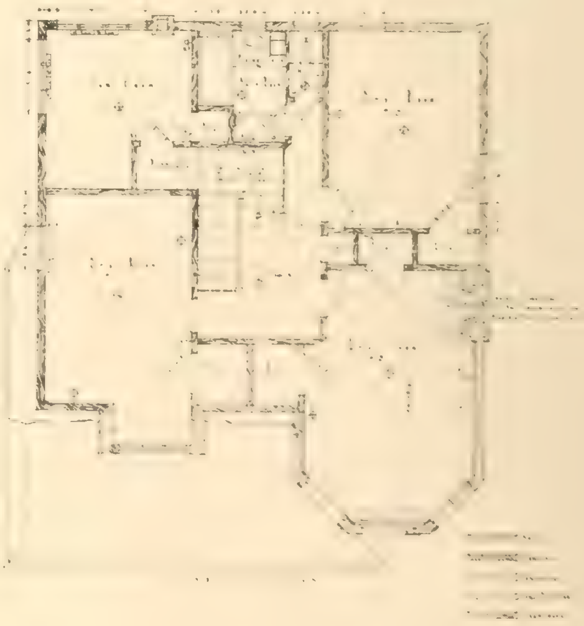
There are three large bedrooms and sun room on the second floor, the main bedroom being carried out over the library at the front. This room has an attractive brick mantel, with tile base, in the side wall directly opposite the entrance. The sun room is off the stair landing and completely isolated from the balance of the rooms on this floor. The bathroom and toilet are separate. Flooring is of plain oak and the trim is in birch as downstairs. A chute to the laundry in the basement, for soiled clothes, is located in the bathroom.

The basement is sub-divided into coal space, boiler room, storage space and laundry. There is a W. C. off the laundry.

This residence was designed by Mr. E. Telfer Arnoldi, architect, of 527 Confederation Life Building, Toronto, and is under construction at Wiarton, Ont.







Large Power Development on the Saguenay

As a result of the negotiations recently concluded between the provincial government of Quebec and a new company organized to develop the power resources of Lake St. John and the Saguenay River, already in its initial stages, announcement was made at the Offices of the Canadian Export Paper Company, Limited, in Montreal today, that Price Brothers and Company, Limited, for whom they act as export selling distributors, have entered upon a three years' program of expansion, which will ultimately increase their present daily output capacity of 300 tons of paper to 900 tons or 280,000 tons a year. The initial work of installation is already under way.

Mainly Constructional

East and West—From Coast to Coast

The Western Terminal Elevator Company have called for tenders for 1,000,000 bushel addition to their grain-handling plant at Westford, Ont. The Saskatchewan Co-operative Company are also having plans prepared for a 2,000,000 bushel addition to their plant at Port Arthur, Ont., which will bring the capacity of this plant up to 8,000,000 bushels, or the third largest in the world. These additions along with two other large elevators, one for the James Stewart Co., and the other for the N. Bawlf Grain Company, will mean a total increase of 7,500,000 bushels in the grain handling facilities at the head of the lakes.

The City of Toronto has agreed to pay the Orient Realty Company $101,000 for the block of property at the northeast corner of Dundas and Victoria streets expropriated in connection with the Dundas street extension.

The first meeting this year of the Water, Power and Light Commission of Weston, Ont., was held in the office of the commission a few days ago with all members present. Mayor R. J. Flynn was unanimously re-elected chairman, Dr. E. F. Irwin chairman of the electric utilities; Harry Cousins of the water branch and Allan G. Pierson superintendent of the combined utilities.

The town of North Bay, Ont., recently experienced a serious shortage of lighting and water services due to a failure at the source of power supply at Nipissing Junction. Electric lighting facilities were completely cut off and lack of power to operate the pumps resulted in a scarcity of water. An auxiliary gas pump was put into operation, however, relieving the water shortage a little. A determined effort is being made by the municipality to secure service from the Hydro Electric Power Commission.

The Algoma Steel Corporation at Sault Ste. Marie, Ont., are making preparations for the re-opening of their rail-mill on March 1, although the nature of the contracts secured have not been made public as yet. The rail mill was closed down on September 1, last year.

The city of Montreal has been authorized by the provincial government to borrow the sum of $300,000 for the purpose of rebuilding the Ontario Street subway, without a referendum to the ratepayers, and preparations are being made to carry out this work next summer. In addition to this the city is authorized to borrow each year the sum of $350,000 for civic improvements, which will this year be used to finance the laying of water services and other urgent municipal improvements.

The 39th annual convention of the International Association of Master House Painters and Decorators of the United States and Canada will be held at the King Edward Hotel, Toronto, on February 6, 7, 8 and 9. Delegates are expected to be present from all parts of the United States and Canada.

A large and representative deputation from Toronto waited upon Hon. J. H. King, Minister of Public Works, and J. B. Hunter, Deputy Minister, a few days ago, to urge provision in this year's estimates for the completion of Toronto harbor's breakwater. Mr. King expressed himself as favorably impressed with their representations, admitted that there would be some economy in completing this work and thus protecting the work already done, and promised to place the matter before his colleagues for decision. The party consisted of R. Home Smith, chairman, and E. L. Cousins, engineer, of the Harbor Board; Robert Fleming, president, and John G. Kent, managing director of the Canadian National Exhibition; Controller Gibbons, representing the city; Thomas Marshall of the Board of Trade, and E. B. Ryckman, David Spence and Joseph Harris, three of the Toronto members of the House of Commons.

A recent report states that there is unusual activity at present in Toronto and district in the early placing of orders for brick. One company is engaged at the present time in the placing of an order for 600,000 brick, to be used in the construction of 60 houses in the Danforth district by one contractor this year. This is but one of several instances cited, where large orders have been placed for early delivery. which indicates a very busy year in the building industry in Toronto and vicinity.

Personal

Mr. E. A. James, of the Toronto engineering firm of James, Proctor & Redfern, returned a few days ago from England where he had been engaged in the inspection of traffic, road and sanitary conditions.

Mr. R. E. Butler was recently re-elected chairman of the Water & Light Commission, Woodstock, Ont., for the Year 1923. This will be the fourth term for Mr. Butler, who has been a member of the commission for the past fourteen years. Mr. Wesley S. West is vice-president.

Mr. Gordon Thompson, superintendent of the Water Works Department, York Township, Ont., will this year take over the additional duties of Road Commissioner for the township. The latter position has been held since March 1921, by Mr. W. W. Graham, who resigned a few days ago.

Mr. Joseph George Ramsden of Toronto, has been appointed to the Hydro Commission, occupying the vacancy caused by the death of Mr. Fred R. Miller last year.

Messrs. Fife & Rowan, 89 Runnymede Rd., Toronto, recently formed a partnership to carry on business as builders. They will begin operations in the spring.

Obituary

Mr. Lachlan E. McKinnon, head of the widely-known McKinnon Industries of St. Catharines, Ont., died at his residence in that city recently, aged 69. Deceased was born in Owen Sound, Ont., and he founded the present industry 35 years ago.

Mr. George Duthie, managing director and secretary-treasurer of the Roofing Supply Co. and president of the Geo. Duthie & Sons Roofing Co., died a few days ago in that city following a two months' illness. Deceased was 67 years of age and had been a native of Toronto all his life.

Hon. W. C. Kennedy, Minister of Railways and Canals, died at Naples, Florida, recently, where he had gone to recuperate after an operation in Montreal. Death was due to heart failure. Deceased was born on August 27, 1868, in Ottawa and first entered Parliament as Liberal member for North Essex in the general elections of December, 1917. He was appointed Minister of Railways and Canals after his re-election in 1921.

CONSTRUCTIONAL ACTIVITY

Period of Jan. 17 to Jan. 23, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Brantford, Ont.
About one mile of Sanitary sewers contemplated by the City Council. H. F. Leonard, clerk.

Eastview, Ont.
Ottawa Suburban Roads Commission, Ottawa, contemplate paving or oiling a stretch of road about 1½ miles long.

Essex, Ont.
Town Council contemplates waterworks extensions. H. A. Bowie, mayor.

Galt, Ont.
Town Council contemplates an expenditure of $20,000 on extensions to sewers. Secretary-treasurer, J. McCartney.

Kingsville, Ont.
Town Council contemplates extending the watermains and sidewalks on Landsdowne Ave. W. G. Long, clerk.

Ottawa, Ont.
Ottawa Suburban Roads Commission, Ottawa, contemplate grading at Billing's Bridge. Allan K. Hay, engineer.

Ste. Clotilde de Horton, Que.
La Cie D'Approvisionment D'Eau contemplate an aqueduct and want to get in touch with a contractor who will build and finance the project.

Simcoe, Ont.
Storm and sanitary sewers costing $2,500 contemplated by the council. G. R. Marston, engineer.

Stephen Twp., Ont.
About 1,000 ft. of 12 in. tile laid. Balance of work will proceed in the spring. G. E. Eilber, Crediton, is laying the Vitrified Pipe; other work by day labor.

Winnipeg, Man.
Tenders wanted by City of Winnipeg for cast iron water pipe. C. J. Brown, city clerk.

CONTRACTS AWARDED

St. Louis De Lotbiniere, Que.
Provincial Government Department of Roads has awarded J. E. Paquin, De Normanville St., Montreal, the contract for an oil macadam road costing $184,000. G. Henry, Parliament Buildings, Quebec, engineer.

Toronto, Ont.
Canada Cement Co. Ltd., Bank of Hamilton, Toronto, have a contract for crushed stone for the Provincial Government.

Railroads, Bridges and Wharves

Elie, Man.
Municipality of Cartier want tenders on a pile bridge. Secretary, H. C. Payment.

Hamilton, Ont.
Dominion Power Transmission Co. Terminal Station, contemplates a single track to McKittrick Survey, about 5 miles long. No plans drawn yet. General Manager, W. C. Hawkins.

Kingsville, Ont.
Dominion Government will make improvements to Kingsville Harbor to the extent of $15,000. Mr. Craig, Royal Bank Bldg., London, engineer.

London, Ont.
G. T. Rly. contemplate relaying the steel between London and Sarnia. Plan to replace the present track with 100 lb. rails. Chas. Forrester, London, superintendent.

Pembroke, Ont.
Plans are drawn for a wharf costing $125,000 for the Dominion Government, Department of Public Works, R. C. Desrochers, Ottawa, secretary.

Three Rivers, Que.
Three Rivers Traction Co. Ltd. contemplates making a $75,000 extension to the street railway next May. J. A. Ryan, engineer.

Public Buildings, Churches and Schools

Assiniboia, Sask.
J. B. Smith, sec.-treas., Assiniboia School District, will receive tenders until Jan. 26 for the erection of a brick addition to the present school building.

Baie St. Paul, Que.
An addition at a cost of $100,000 is contemplated by the hospital directors. Work may go ahead this year. F. X. Gariepy, interested.

Brampton, Ont.
Peel County Agricultural Society contemplate a hall at a cost of about $8 000. Work is expected to start in the spring. J. H. Watson is the secretary.

Brentwood, B. C.
Plans are being prepared for alterations to a Public School by a syndicate represented by Pemberton & Son. Architect, R. P. Spurgin, Victoria.

Delhi, Ont.
Womens' Institute contemplate either the erection of a memorial hall or the purchase of a hall now available, which they would remodel.

Hamilton, Ont.
Hamilton City Council has recommended that Whitton & Walsh, Bank of Hamilton Building, be appointed the architects for the proposed addition to the general hospital.

M. E. Goodale & Son, Cannon St., have the contract for moving St. Ann's R. C. Church on which alterations to the extent of $12,000 are being made. Rev. W. Englert, priest.

Hurdman's Bridge, Ont.
School section No. 10 contemplates a school house. Jas. Dempsy, interested.

Kentville, N. S.
I. Graham is preparing the plans for the Masonic Lodge. Max De Long, chairman of building committee.

Lakeview, Ont.
S. S. No. 7, Toronto Twp., is having plans prepared for a public school to cost about $34,000. C. M. Hare, Toronto, is the architect.

Tenders will be called for about March or April by The G. A. U. V. for work on a Community Hall. C. M. Hare is preparing the plans. Mr. Choles, Stop 35 Lake Shore Rd., secretary.

La Providence, Que.
Work will probably go ahead in the spring on proposed school. S. Rene Richer, Girouard St., St. Hyacinthe, architect.

Lindsay, Ont.
Council has approved of the building of a public lavatory in the cellar of the market building. W. R. Alley, clerk.

London, Ont.
Cronyn Memorial Church contemplates a Parish Hall. Architect not yet appointed. Rev. C. Q. Warner, rector.

St. James Anglican Church contemplates an addition to the Sunday school at a cost of $25,000. Architect is not yet chosen.

Estimates will be secured as to the cost of building a garage to house all city owned cars. G. A. Wenige, mayor and chairman of committee.

New tenders are being received by Samuel Baker, city clerk, until Jan. 26 for $50,000 registry office. A. M. Piper, City Hall, architect.

Midland, Ont.
Town Council has had plans prepared for a fire hall costing $14,000. Wilf. Smith, architect; C. E. Smith, clerk. By-law will be submitted at the end of January.

Millbrook, Ont.
A. A. McIntyre, Peterboro, will probably receive the general contract for the addition to Millbrook school.

Montmagny, Que.
Pierre Levesque, architect, Rue St. Jean, Quebec, reports an additional contract for $225,000 church let as follows: Cyrille Labrecque, Sauvageau St., Quebec., galvanized iron work at $6,990.

Montreal, Que.
General contract for a $50,000 chapel has been awarded to T. Gauthier, Mercer St. Tenders will be called for about March for sub-trades.

Mount Carmel, Ont.
Separate School Board has had plans prepared for a $12,000 school. Father

Corcoran, Carmel via Parkhill, chairman.

North Bay, Ont.
House of Refuge contemplated by City Council. W. N. Snyder, clerk.

Ottawa, Ont.
Alterations to the interior of a public library contemplated. W. J. Sykes, librarian.

St. Mathew's Anglican Church, R. H. Veale, People's Warden, have decided to build a new church.

Dressing room and lavatory contemplated for Gladstone Ave.; Mr. Morgan, Superintendent of Playgrounds.

St. Paul's Methodist Church contemplate going ahead with the balance of the work on $120,000 church shortly. Rev. T. E. Holling, 122-4th Ave., minister.

Pembroke, Ont.
School costing $100,000 contemplated. W. C. Keighley, architect; Alex. Morris, chairman.

The Separate School Board will shortly complete four rooms of a school at a cost of $3,000. Millson & Burgess, 209 Sparks St., Ottawa, architects.

Port Colborne, Ont.
Work will probably commence in the spring on the $25,000 Parish House for the Catholic Church. N. A Kearns, Welland, Ont., architect.

Puce, Ont.
S. S. No. 7 contemplates a school costing $10,000. Chas. Patullo, secretary.

Quebec, Que.
Plans are being prepared for an apartment containing seven suites, by Audet & Laberge, St. John St. E. Trudel, Burton Ave., owner.

Tenders will be called for at the end of this month for the addition to the "St. Malo" convent, Tanguay & Chenevert, architects.

Regina, Sask.
Collegiate Institute Board contemplate a 10 room addition. Storey & Van Egmond, architects. Cost will be about $125,000.

Saanich, B. C.
Lake Hill Community contemplates a hall. Cost will be about $4,000.

St. Christophe, Que.
Roman Catholic Commission want tenders on an $8,000 school, C. R. Garneau, secretary.

St. Laurent, Que.
Tenders will probably be called for in the spring for an extension to the college. Rev. E. Mondou, director.

Shelburne, Ont.
Plans are to be prepared for the School Board for a $50,000 school. J. W. Hamilton, chairman of the Board.

Simcoe, Ont.
Board of Education contemplates a school for the North Ward. Secretary, A. M. Munro.

South London, Ont.
Work will go ahead in the spring on the proposed $100,000 High School. Plans are being prepared and site will be selected. Chairman of High School Committee, A. E. Silverwood.

Springford, Ont.
Community Hall proposed by Town Council and plans are being prepared.

Toronto, Ont.
Davenport Presbyterian Church contemplates alterations and additions to their building at a cost of $30,000. Architect not yet appointed. Rev. J. A. Hiltz, 129 Lauder Ave., minister.

Tillsonburg, Ont.
Town Council contemplates the expenditure of $4,000 to $6,000 on improvements to the market square. This work is in conjunction with the Soldiers' Memorial planned, costing about $8,000.

Council also proposes to build new sheds at the rear of the Town Hall early in the spring. A. E. Raynes, clerk.

Walton, Ont.
Board is considering the building of a new school. Jas. McDonald, trustee.

Welland, Ont.
Market Committee has ordered tentative plans on a $15,000 cost basis for the proposed Market Hall. N. A. Kearns, Temple Building, architect.

Windsor, Ont.
Roofing, painting, plastering, plumbing, heating and wiring contracts for $330,000 addition to public school to be let. School equipment will be required.

Correction

Windsor, Ont.
Report in Jan. 10 issue stating that glazing contract for branch for Banque Provinciale du Canada had been awarded to A. F. Ramsay & Co., Montreal, was erroneous. Banque Provinciale advise us that plans for this building have not yet been prepared.

CONTRACTS AWARDED

Hamilton, Ont.
The general contract for the addition to Children's Shelter at cost of $20,000 has been awarded to Mackay Bros., St. Eloi Apartments.

General contract for alterations to Post Office awarded to K. Connor, Lamoreux St. Sub-trades will be let.

Montreal, Que.
Geo. Belanger, Chambly St., has the contract for brick for $60,000 church; M. Chouinard, Adams St., contract for roofing; J. A. St. Armour the electrical contract and Allard & Desnoyers the contract for sash and doors. Prices wanted on 15,000 feet or red fir.

Contracts for the alterations to the dental building awarded as follows: Hybrids for roof, Trussed Concrete Steel Co.; lockers, Fred. Medart Mfg. Co.; plastering, Gilletz & Co.

Mount Hamilton, Ont.
Adam Clark has the plumbing contract and A. Rodgers & Co. have the heating contract for $100,000 school.

Ottawa, Ont.
Dominion Bridge Co., has the contract for steel in Ottawa's $2,500,000 general hospital.

St. Alexandre D'Iberville, Que.
The heating contract for $20,000 improvements to the Catholic Church let to J. A. R. Seguin, St. Hyacinthe.

St. Pierre Aux Liens, Que.
Lockers and toilet partitions in the $121,000 school and residence installed by Dennis Wire & iron Co. Ltd., Victoria St.

Three Rivers, Que.
Valere Garceau, Ste. Julie St., has the plastering contract for the extension to Sisters Marie Reparatrices' Convent, being made at a cost of $30,000.

Toronto, Ont.
General contract for Gerrard St. Methodist Church has been awarded to C. A. Scott, Standhope Ave. General contractor will appoint the architect.

Business Buildings and Industrial Plants

Alexandria, Ont.
J. C. Hout, contemplates a store to replace the building recently destroyed by fire at a loss of $10,000.

Amherstburg, Ont.
Consolidated Stamping & Toy Manufacturing Co. contemplates alterations to their factory.

Brantford, Ont.
Pratt & Letchworth & Co. Ltd., contemplate alterations and additions to their factory.

Burlington, Ont.
L. McKinley contemplates altering an office to a battery and service station.

Cap de la Madeleine, Que.
J. L. Fortin, St. Maurice Valley Chronicle, will rebuild printing plant destroyed by fire.

Capreol, Ont.
Geo. Duncan, Capreol, is building a $4,000 Pool Room for J. Aimer.

Georgetown, Ont.
Steam piping, electric wiring, conduit and fixtures for $35,000 business block, not purchased. J. N. O'Neil & Son, owners.

Hamilton, Ont.
Store and residence contemplated by L. Rosenblood at cost of $15,000.

Stores and apartments costing $25,000 contemplated by U. L. Campbell, Barton Ave., E.

Humberstone, Ont.
Humberstone Shoe Co. have the foundation in for a factory costing $60,000. C. C. Knoll, manager.

Levis, Que.
Morris Segal, Commercial St., will rebuild a $20,000 store destroyed by fire.

Lindsay, Ont.
Two storey brick front garage contemplated by E. D. Fee, William St.

London, Ont.
D. McCrimmon & Sons, Dundas St., contemplate occupying the entire building at that address, remodeling and equiping it as offices and warehouse.

Manmer, Ont.
Tranbly Bros. contemplate a feed stable. Work is expected to commence shortly.

Montreal, Que.
D. Boileau, Bonsecour, will probably

call for tenders on sub trades on stores and flats in a month's time.

J. B. Lafortune, Christophe Colombe St., wants prices on lumber, crushed stone, sand and cement for stores and flats contemplated.

L. Deshosiers, Hadley St., contemplates a public garage.

J. A. Valliancourt, Metana St., contemplates a two storey brick stable.

C. G. Kertland, Grosvenor Ave., contemplate a molasses distillery.

Mount Dennis, Ont.

Plans are being prepared for the first unit of a plant for the Electroplax Co., York Building, Toronto. H. E. Cory, general manager; H. M. Hyland, engineer.

North Bay, Ont.

Doyle Bros., Main St., contemplate a garage costing about $15,000. Plans are not yet drawn.

Port Burwell, Ont.

Plans for a freezing plant and fish house are being drawn. G. A. Van Order will build as soon as weather permits.

George Brown contemplates building a theatre and has purchased a site.

Regina, Sask.

Storey & Van Egmond, McCallum Hill Bldg., are the architects preparing plans for an office building to cost $40,000.

Sault Ste. Marie, Ont.

Algoma Steel Corporation expect to start work at once and open a steel rail mill about Mar. 1. Purchasing agent, S. V. McLeod, Putney Rd.

Simcoe, Ont.

Negotiations have been completed for moving Burford Knitting Mills to Simcoe. Building will probably be purchased and equipped. Bell & Burgess, proprietors.

Stratford, Ont.

Neil M. Upshall, President of Stratford Frames and Novelties, will receive tenders on a $28,000 factory until Jan. 31.

Tillsonburg, Ont.

Borden Milk Co., Ingersoll, contemplate the re-opening of the Tillsonburg plant. $7.000 worth of butter and cheese making machinery to be purchased at once and $50,000 worth to be bought later.

Toronto, Ont.

N. A. Armstrong Co. Ltd., 7 King St. E., Toronto, are preparing plans for an office building and lunch room, 7 storeys, to cost about $750,000.

H. Addison Johnston, Lake Front, contemplates stores and apartments on Queen St. E.

Bell Telephone Co. contemplates alterations to their Adelaide St. building Contracts will be let shortly.

An office and shipping building will be erected by the City Dye Works Ltd. and B. Brown, 487 Spadina Ave., architect, wants tenders on excavating.

James Smith Monument Co., Merton St., receiving estimates on construction work and expect to proceed about Feb. 1

An office building is contemplated by Percy Hermant, c/o Imperial Optical Co. Architect not yet appointed.

Six storey office building contemplated by Gelber Bros., Richmond St. Benj. Brown, Spadina Ave., architect.

T. LeDrew, Meagher Ave., will commence work shortly on stores and apartments costing $10,000.

Plans are drawn and tenders will be called next week for an addition to the plant of Palmolive Soap Co. Ltd., Natalie St.

Bawden Machinery Co. Ltd., Sterling Rd., contemplate rebuilding a machine shop destroyed by fire.

Green River Co. of Canada Ltd., Richmond St., contemplate a bottling plant. Architect not yet appointed.

J. Lucas, Gillard Ave., contemplates stores and residences. Interested in suitable building sites.

C. S. Lucas has purchased a block of land and contemplates stores with apartments above. Work may start in the spring.

Harry Lucas, Ellerbeck Ave., contemplates stores and apartments in the Danforth district.

Vancouver, B. C.

Bank building contemplated by Bank of Toronto. Benzie & Bow, architects; E. W. Lamphre, local manager.

Victoria, B. C.

Bank of Montreal wants tenders on a $250,000 building. Honeyman & Curtis, architects, are receiving tenders for which no closing date is set. Tenders will be selected from Vancouver and Victoria contractors. Local manager, A. Montizambert, Government St.

Windsor, Ont.

J. Schartz, Victoria Ave., is excavating for a store estimated to cost about $12,000.

H. C. McMordy, Imperial Bank Building, prepared plans for the rebuilding of a $25,000 business block to be occupied by Molsons' Bank. John V. Gray Construction Co. has the general contract.

Witchell-Theil Co., Brooklyn St., Detroit, contemplates a factory costing $100,000.

Winnipeg, Man.

A store is contemplated by E. H. Hedd, Balmoral Place. E. W. Crayston, Bannatyne Ave., architect.

CONTRACTS AWARDED

Montreal, Que.

W. Lajeunesse & Co., Notre Dame St., have awarded contracts as follows for stores and flats: Steel, Dominion Bridge Co.; brick, D. Savard.

MacKinnon Steel Co. Ltd., Cathcart St., has the contract for steel in the A. T. Stewart Co. Ltd., office and bottling plant.

A. Pion, general contractor has awarded the following contracts on a $16,000 store: Electrical, W. Rochon, Parc Lafontaine St.; sash and doors, H. Chagnon & Cie Ltee., Burnett St.

New Toronto, Ont.

Plans for three stores and apartments costing $25,000 prepared by Neil G. Beggs, and brickwork contract awarded to F. & A. E. Ham, Toronto.

Preston, Ont.

The heating contract for $225,000 sanitarium has been awarded to Battler & Frieburgeher, King St. W.

Toronto, Ont.

F. G. Roberts & Co. Ltd., Wells St., have the painting contract for the "Grover" telephone exchange.

Giles, Rice & Peters, Galt Ave., have let the heating contract for the $25,000 addition to their garage to Duffort Bros., Kingston Rd.

The general contract for Levi Bros warehouse has been awarded to Jas. Gordon, Broadview Ave.

Bennett & Wright, Queen St. E., have the contract for electrical work on $350,000 office building being erected by the Robert Redford Co., Montreal.

Residences

Brantford, Ont.

Dr. J. A. Phillip, Colborne St., is having plans prepared for a residence costing $22,000. Architect, H. R. Watson, Excelsior Life Bldg., Toronto.

Alexander Lamb, 101 Arthur St., contemplates the erection of four residences at a cost of $12,000.

Donnacona, Que.

Leandre Frenette contemplates a $7,000 three storey residence.

Edmonton, Alta.

$4,000 residence contemplated by J. Madill. G. P. Paxton, is the general contractor.

Haileybury, Ont.

G. Burns is building a residence in Haileybury which will cost $5,000.

Hamilton, Ont.

Fred. Beldham, Belmont St., has excavated for a residence to cost about $5,000.

Harry Langer, Maple Ave., contemplates the erection of five residences. Work will proceed in the spring.

Three residences will be built this spring on Graham St., by J. Higginson, Emerald St. N.

Miss N. Gates, Kensington St. N., contemplates a two storey brick residence costing $7,000.

Kitchener, Ont.

S. Dippel, Pequegnat Ave., is building a $6,000 house for G. Zeigler, Queen St., N.

London, Ont.

Three residences costing $7,500 contempated by J. Gould, Partridge St.

John Hayman & Sons, Wellington St., are considering the erection of an aprtment house costing $100 000. Interested in prices of all materials.

Residence costing $6,000 contemplated by C. J. Adkins, Bellevue Ave.

S. Stewart Pavey, Standard Bank Building, has prepared plans for three residences for F.B. Ware. They will cost about $18,000.

Montreal, Que.

F. Morrissette, Bordeaux St., has had plans drawn for a residence costing $10,000.

Residence costing $8,000 is being built by H. Glennay, Fabre St.

Foundations are in for a $8,000 residence for R. D. Vibert, St. Catherine St. W. I. Idon has the general contract.

Residence costing $20,000 contemplated by E. Lalibert, Orleans St.

Jos. L'Archeveque, Lafontaine St., contemplates 33 flats costing about $100,000. Tenders are wanted on cut stone, cartage and stone work. Prices wanted on all materials.

J. P. Tremblay will probably build a residence on Vendome St., Notre Dame de Gras, this spring.

J. Mathieu, Nicolet St., contemplates an $8,000 house.

Outremont, Que.
Guidazio & Besozzi, Stuart Ave., contemplate building 10 cottages costing $90 000. Prices wanted on carloads of cement, sand, crushed stone and screenings, cottage brick and lumber.

Point Grey, B. C.
Residence costing $3,500 to be built by T. O. Little, 13th Ave. W,. Vancouver.

Rockcliffe, Ont.
S. Gardham, Chapel St., Ottawa, has almost completed plans for a $10,000 residence.

St. Mary's, Ont.
Fred Howell contemplates a residence costing $5,000.

Work has started on seven of the ten residences contemplated by Dr. P. F. Coupland. Cost to be about $4,000 each.

Toronto, Ont.
This spring J. Baxter, owner and builder, will commence work on two pair of residences costing $7,000 per pair.

Walls are up for an apartment house costing $70,000 being built by Merrill System, Union Trust Building, Toronto Contracts for roofing, electrical, heating and plumbing to be let.

H. Addison Johnston, Lake Front contemplates six residences on the Lake front.

Dr. J. W. Ross, Bloor St. E., contemplates a residence. J. B. Keith Fisken, Scott St., Toronto, has prepared the plans and called for tenders.

Geo. W. Cain, Kingswood Ave., is building two residences costing $5,000 each.

H. A. Johnston, Lake Front contemplates the erection of an apartment house. Work will commence about May.

D. C. Kay, Ashdale Ave., contemplates about 15 residences this spring. He has also secured the site in North Toronto for a business block with apartments.

Five bungalows costing $6,000 each are contemplated by F. A. Smith Balsam Ave.

Thos. E. Vallentyne & Co., Shaw St., are building a $12 000 residence for Mrs. Cuddy. General contractor will let other trades.

W. F. Smith, Glenview Ave., will build a $7,500 residence.

Nine residences are contemplated by H. Jenkins, 341 St. Clair Ave. Work will proceed about Mar. 1.

Plans are being prepared and tenders will be called about Feb. 1 for a $20,000 residence. H. R. Watson, architect.

Allen & Yeaman, Shaw St., are receiving tenders for plumbing, heating, wiring and plastering a $15,000 residence.

Residence costing $10,000 being built by W. S. Jury, Delevan Ave. Foundations going in and remainder of work will be finished in the spring.

Law & Smith have decided to erect two detached residences in the Wychwood district.

Two detached residences costing $6,500 being built by Courtney & Greer, Sherwood Ave.

H. L. Kennedy, Northcliffe Blvd., has excavated for a pair of residences costing $7,000.

R. R. Wilson, Cavendish Ave., is excavating for a $5,500 residence. General contractor is H. Catterall.

Waterloo, Ont.
W. H. E. Schmaltz, Queen St. S., Kitchener, Ont., is preparing plans for a $6,000 residence for S. Pauli.

Windsor, Ont.
H. T. Johnstone, Hall Ave., will build a residence costing $5,000.

Excavating is in progress for a two family residence costing about $11,000 for A. L. Evans, Wyandotte St.

CONTRACTS AWARDED

Montreal, Que.
Contracts have been awarded on P. Dufour's $16,000 residence as follows: T. X. Guay, Culliver St. roofing; J. A. Paquin, plumbing; M. Pardis, Warwick, Que., sash and doors.

Roofing contract for $9,000 residence awarded to F. X. Guay, Culliver St.; plumbing contract awarded T. Daigle, Ontario St. Prices wanted on B. C. fir sash and doors.

The following contracts on S. Cantin's $8,000 residence have been awarded: Electrical, J. H. Lamarre, Delorime St.; plumbing and heating, Houde & Lavoie, Ottawa St.; plastering, Baron & Gariepy, Breboeuf St.; brick, M. Boyer, Denormanville St.; roofing, Z. Robatille; sash and doors, M. Desjardins, Terrebonne, Que.

F. Dansereau, Hampton Ave., has awarded the following contracts on a $14,000 house: Roofing, J. E. Mayer, Lafontaine Pk.; plumbing, Laflame & Courtemanche, Decaire St.; tenders are wanted on brick work and plastering.

Contracts on two residences costing $12,000 being built by F. Morrisette, Bordeaux St., awarded as follows: Brick, C. Frenette; roofing, Lauson Riopel & Cie; electrical, R. Chamberland; plumbing, M. Bellair; plastering, D. Perron; painting, Lavoie & Perron; sash and doors, Abel-Fortin & Co. and Mantel & Remillard.

Dominion Sheet Metal Works has the roofing contract for 21 residences, Jos. Dembrosio, the plumbing contract and J. Lard, the painting contract. These are a part of the 200 residences proposed by Corporation Des Lodgements Ouvriers Ltd., St. Catherine St. R. Charbonneau, architect.

Contracts on $9,000 flats that U. Topin is building have been awarded as follows: Brick, L. Paquin; roofing, M. Desjardins; electrical, N. L'Allier, plumbing, M. Paquin; plastering, J. Turcotte; lumber, J. P. Abel-Fortin Ltd.; sash and doors, Victor Varin.

Contracts on four residences costing $40,000 being built by J. Tremblay, awarded as follows: Roofing, J. St. Armour; plumbing and heating, A. Blais; tiling and marble, E. LePage.

Ottawa, Ont.
Guick Bros., Cummings Bridge, have awarded the following contracts on two residences: Electrical, J. Ladouceur; plumbing and heating, Bronke, Nordman's Rd.; plastering, P. Beaupre. Painting will be done by day labor.

Outremont, Que.
Beaubien Ltd., c/o F. A. Sauvageau, St. Dennis St., is building four cottages costing $60,000. Millwork and interior trim has been awarded to J. P. Abel-Fortin Ltd., Maisonneuve, Que.

Three Rivers, Que.
La Cie de Construction des Trois Rivieres Ltee., have the general contract for a $10,000 residence and the brick and concrete contracts for another.

The general contract for an $8,000 residence for Romeo Sarrasin, St. Joseph St., has been awarded to A. Lacerte.

La Cie de Construction des Trois Rivieres, has the general and masonry contracts for 8 tenements costing $16,000.

Toronto, Ont.
H. R. Watson, Excelsior Life Bldg., has let the following contracts on a $95,000 apartment house: General contract, W. S. Jury, Delevan Ave.; masonry, T. F. Norman, Blandford St.

Contracts awarded as follows on two residences costing $15,000 being built by G. Garfunkle, Brunswick Ave.: Heating, W. H. Miles, Dupont St.; plumbing, W. Stevens; plastering, Wm. Law, Innis Ave.

P. Balderson, Spruce Hill Rd., has let the following contracts on a $9,000 house: Electrical, T. Meade, Silverbirch Ave.; heating, W. J. Merrill, Kingston Rd.; plumbing, W. E. Manners, Queen St. E.; pastering, H. Hill, Lawlor Ave.

Contracts on H. A. Babcock's $7,000 residence awarded as follows: Electrical and plumbing, H. Hicks Co., Church St.; heating, W. H. Miles & Co., Dupont St.; plastering, E. Coath, Albany Ave.

W. H. Raine, Glencairn Ave., has the plumbing contract for a residence costing $7,000. H. Elgie, Blythwood Rd., owner. Contracts for painting, plastering, plumbing and heating to be let.

M. Healey, Glen Rd., has awarded the following contracts on two duplex residences costing $9,000: Plumbing, Leyland & Co.; heating, Duncan McIntyre, Seaton St.

J. Fraser, 808 Danforth Ave., has the heating and plumbing contract for a duplex residence costing $15,000. Electrical contract awarded to H. A. Everist, Eastmount Ave.

S. Dousley, Euclid Ave., is building two duplex residences for which the following contracts have been awarded: Heating, D. McIntyre, Shaw St.; electrical, A. Duckworth; Jas. Gordon, Broadview Ave., has the general contract.

Victoria, B. C.
W. A. Allward is building a residence

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

Tenders for Supplies

Tenders will be received by registered post only, addressed to the Chairman, Board of Control, City Hall, Toronto, up to 12 o'clock noon, **Tuesday, January 30th, 1923**, for the supply and delivery of:

Tender No. 11—Treated Wood Blocks.
Tender No. 14—Portland Cement.
Tender No. 15—Mineral Dust or Filler.
Tender No. 16—Gravel.
Tender No. 19—Iron and Steel.
Tender No. 21—House Numbers.
Tender No. 28—Sand.
Tender No. 30—Rubble Stone.

Envelopes containing tenders must be plainly marked on the outside as to contents

Specifications and forms of tender may be obtained at the Works Department, Room 12, City Hall. Tenders must comply strictly with conditions of City By-law as to deposits and sureties as set out in specifications and forms of tender.

The lowest or any tender not necessarily accepted.

C. ALFRED MAGUIRE, (Mayor)
4 Chairman Board of Control.

SALE OF BUILDINGS AND SITE

Sealed tenders addressed to the undersigned and endorsed "Tender for the purchase of buildings and site, St. Andrew's College, Toronto, Ont.," will be received at this office until 12 o'clock noon, **Tuesday, January 30, 1923,** for the purchase of the buildings known as and now occupied by St. Andrew's College and the site on which these buildings stand, which property is bounded on the North by Summerhill Avenue and on the East by MacLennan Avenue, on the South by Schofield Avenue and the Toronto Athletic Grounds, and on the west by a ravine and partly by Summerhill Avenue, Toronto.

The party whose tender is accepted must make payment as follows;—25% cash down when offer is accepted and balance in three equal, annual instalments, with interest at six per cent (6%) per annum.

Each tender to be accompanied by an accepted cheque on a chartered bank, equal to 10 per cent of the amount of tender, payable to the order of the Minister of Public Works, which will be forefeited if the person tendering decline to carry out his bid. War Loan Bonds of the Dominion will also be accepted as security, or War Bonds and cheques if required to make up an odd amount.

The Department does not bind itself to accept the highest or any tender.

By Order,

R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, January 13, 1923. 3-4

STEEL PILING

1000 tons 40′ long.
14″ x ⅜″ Arch Web.
7″ x ¼″ Straight Web.
All ready to load.
UNIVERSAL EQUIPMENT COMPANY,
1 T.f. Niagara Falls, Ont.

RATES

20 cents per agate line (14 lines to the inch) Positions Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

ONTARIO

Notice to Contractors

Separate sealed tenders marked "Tender for Contract No. ......" will be received by the undersigned until 12 o'clock noon on **Monday, February 26th, 1923,** for the following work on the Provincial Highways:

Concrete Pavement

Contract No. 827 Westerly from pavement west of Chatham, 3.7 miles.
Contract No. 828—Clappison's Corners to Bridge No. 3. 2.0 miles.
Contract No. 829—Manotick, 0.54 miles.
Contract No. 839—North Gower, 0.70 miles.
Contract No. 840—Kemptville, 1.0 miles.
Contract No. 841—Spencerville, 0.65 miles.
Contract No. 915—Dougal Ave. to Howlard Ave., 1.75 miles.

Asphaltic Concrete Pavement

Contract No. 830—Stratford easterly, 3.6 miles.
Contract No. 831—Port Credit to Cooksville, 2.43 miles.
Contract No. 919—Yonge St., from Thornhill to Northerly limits of Vaughan Twp., 6.9 miles.

Macadam Roadway

Contract No. 832—In West Limits of Morrisburg 0.3 miles.
Contract No. 833—Rideau N.E. 4.0 miles, including grading.

Macadam Base Course

Contract No. 834—Caledonia Northerly 5.7 miles,

Grading

Contract No. 835—Plantagenet Easterly 8 miles.
Contract No. 838—Haley's Deviation 6.0 miles.
Contract No. 842—Whitby-Lindsay, 5 miles.
Contract No. 843—Whitby-Lindsay 5 miles.
Contract No. 845—Goderich East 3.9 miles.
Contract No. 846—Seaforth to Mitchell 6.0 miles.
Contract No. 847—Kincardine Township 5.0 miles.
Contract No. 922—Beachburg West 5.2 miles.
Contract No. 923—Smith Falls, N.W. 4.0 miles.
Contract No. 870—Brampton S. 1.9 miles.
Contract No. 924—Brampton Northerly 10.4 miles.
Contract No. 925—From 1 mile West of Hurontario Street (Brampton) Westerly 3.0 miles.
Contract No. 926—Oldcastle to Dougal Road 2.9 miles.
Contract No. 927—From 4 miles South of Guelph Southerly 4.0 miles.
Contract No. 928—From W. Limits of E. Williams Easterly 2.5 miles.
Contract No. 929—Lot 9 to Lot 15, Plympton-Sarnia gravel road 2.5 miles.
Contract No. 930—Greenock and Kinloss Twps., 4.2 miles.
Contract No. 931—Two miles West of Arthur Westerly 1.5 miles, and 9th. to 11th. Con. Arthur Twp. 1.8 miles.
Contract No. 932—Aylmer Easterly 3.0 miles.

Surface Treatment of Macadam Roads with Tar

Contract No. 849—From 3.2 miles West of Cornwall to Lancaster 12.3 miles.
Contract No. 850—Barriefield N. Easterly 4.70 miles.
Contract No. 851—Orillia towards Washago 5.0 miles.

Concrete Culverts

Contract No. 852—Ekfrid Township.
Contract No. 853—Mosa.
Contract No. 854—Gosfield South and Raleigh.
Contract No. 855—Eramosa.
Contract No. 856—Warwick.
Contract No. 857—Caradoc.
Contract No. 858—Minto, Arthur, Peel and Maryborough.
Contract No. 859—Minto and Howick.

Plans, specifications, information to bidders, tender forms, and tender envelopes may be obtained on and after Wednesday, January 31st, 1923, at the office of the undersigned, or from the following Resident Engineers:—J. Sears, Chatham; H. C. Rose, Guelph; G. G. Greig, Waterdown; R. S. Smith, Renfrew; J. M. Empey, St. Marys; G. A. Downey, Walkerton; H. E. MacPherson, Barrie; C. H. Nelson, Whitby; C. E. Bush, Orangeville; A. L. Baldwin, Brockville; J. G. Smith, St. Thomas; R. MacLennan, Cayuga; F. Brinkman, L'Original; J. A. Tom, Stratford; A. H. Parker, Cornwall; H. A. Smail, Kingston; W. M. Webb, Kingsville; A. Earchman, Carleton Place; D. H. Philp, Toronto.

A marked cheque for $1,000.00 payable to the Minister of Public Works and Highways, Ontario, or a Guaranty Company's bid bond for a similar amount must be attached to tenders for pavements, base course, and bridge construction, and on all other tenders the above conditions apply, but the amount of bond or cheque required is $500.00. A Guaranty Company's Contract Bond for 50 per cent. of the amount of the tender will be furnished by contractor when contract is signed. All bonds must be made out on Departmental forms.

The lowest or any tender not necessarily accepted.

W. A. McLEAN,
Deputy Minister of Highways.

Department of Public Highways, Ontario,
Toronto, January 24th 1923. 4

WANTED—English firm wishes to purchase large quantity of new and good second-hand screwed and socketted Tubes, sizes 2″ to 6″. Also Weldless Loose Flanged Tubes. Write "Tubes" c/o Taylors, 30 Fleet Street, London, England. 4-5

BUILDING MATERIALS, contractors and mill supply agencies wanted for St. Maurice Valley district by two engineers well connected and starting up sales business. Apply P.O. Box 84, Three Rivers, Que. 4

read the "Contract Record." It is the logical Vancouver the inspection is a problem. We,

Tenders for Travelling Crane

Tenders will be received by registered post only, addressed to the Chairman, Board of Control, City Hall, Toronto, up to 12 o'clock noon, Tuesday, January 30th, 1923, for the following:

Tender No. 36 One Overhead, Hand-Operated Travelling Crane

Envelopes containing tenders must be plainly marked on the outside as to contents.

Specifications and Forms of Tender may be obtained at the Works Department, Room 12, City Hall. Tenders must comply strictly with conditions of City By-law as to deposits and sureties, as set out in specifications and Forms of Tender.

The lowest or any tender not necessarily accepted.

C. ALFRED MAGUIRE, (Mayor)
4 Chairman Board of Control.

Business for Sale

One third interest in going general contracting company. Good plant and A1 reputation. Two thousand cash and balance secured. Must be able to take active interest. Box 108, Contract Record, Toronto. 4-5

costing $3,600. General contract let to F. J. Mitchell, Monterey Ave.

Waterloo, Ont.
Heating and plumbing contracts for two residences costing $4,500 each have been awarded to W. Knell, King St., Kitchener. Ellert Bros., have the general contract.

Power Plants Electricity and Telephones

Campbellville, Ont.
With the by-law carried the village council plans to proceed with Hydro Electric lighting and power distribution system. Will proceed with the work as soon as possible.

London, Ont.
Bell Telephone Co. plans extensions into Manor Park. C. H. Beard, manager.

London Twp., Ont.
Township Councils of London and Lobo contemplate taking over three private systems and making extensions and improvements. London Twp. Clerk, Miss Mary Grant, 110 Dundas St., London; Lobo Twp. Clerk, E. R. Barelay, Poplar Hill, P. O.

Megantic, Que.
Tenders will be received by the Town Council for a concrete dam and other work, until Jan. 22. D. L. Lippe, clerk; J. O. C. Mignault, Sandborn St., Sherbrooke, engineer.

St. John, N. B.
The Civic Hydro Commission will call for tenders on a sub-station costing $100,000, shortly. Plans are being prepared for a switch board and equipment and tenders are being received on western or native cedar poles. G. G. Hare, City Hall, engineer.

Sheet Harbour, N. S.
A. T. Croft, Halifax, N. S., will receive tenders until Feb. 5 for the construction of a timber crib, earth fill and bear type dams for storage units. T. M. Rawding is the general contractor.

South Woodslee, Ont.
Town Council contemplates an extension to Hydro lines.

Thurso, Que.
Town Council contemplates the purchase of two electric pumps (centrifugal).

CONTRACTS AWARDED

Sheet Harbour, N. S.
The general contract for a $37,500 transmission line from Malay Falls to Hopewell was awarded to Thos. M. Rawding, Liverpool, N. S. Tenders will be called for shortly for the construction of 6 wood and earth dams.

Miscellaneous

Fredericton, N. B.
The Palmer McLellan Co., York St., will instal a new boiler in their factory about May 1.

London, Ont.
London Tennis Club plans to construct tennis courts and later erect a clubhouse. John Puddicombe, 216 St. George St., London.

Montreal, Que.
Sketch plans for a $75,000 addition to the Young Men's Hebrew Association's building have been drawn by C. Davis Goodman.

J. R. Layer & Cie, 1349 Berri St., a recently formed company, will carry on business as general contractors.

Ottawa, Ont.
Barret Bros., Catherine St., are making an extension to their sash and door factory. Will need equipment and machinery.

Port Elgin, Ont.
Prices are wanted at once by the Stevens Hepner Brush Co. on maple, birch and white ash logs; also elm, basswood and poplar.

St. Zotique, Que.
Town Council has awarded N. A. McDonald, Dalhousie Station a $22,000 gravelling contract.

Toronto, Ont.
Moloney Electric Co. of Canada, Ltd., recently incorporated with a capital of $500,000 have purchased the Fairbanks-Morse Tractor Building, Sterling Rd. They will manufacture electric appliances, etc.

Jas. Pears, Eglinton Ave., contemplates a bowling alley. No materials purchased and architect not yet appointed.

National Fireproofing Co. of Canada Ltd., Dominion Bank Bldg., want prices at once on two tons of steel rails, 20 lbs. New or second hand.

CONTRACTS AWARDED

Toronto, Ont.
G. W. Lucas, Bathgate Ave., has awarded the following contracts on a bowling alley: Electrical, G. A. Newman, Furniss Ave.; plumbing, H. Wilkie, Broadview Ave.; heating, Ward Bros., c/o owner; plastering, G. T. Pritchard, Dawes Rd.

Fires

Capreol, Ont.
Pool room owned by Angus O'Connor destroyed at a loss of $13,000.

Gadshill, Ont.
$4,000 residence owned by Peter Seip destroyed by fire.

WE WILL BOND YOU

The Contractor's Money
should be kept at work and not tied up on Tenders. Let us bond you. You save money. You gain credit.

Resources over - - $31,790,000
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W. R. Kirkpatrick
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UNITED STATES FIDELITY & GUARANTY COMPANY

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Subscriptions may be placed for any one city, portion of a Province or more than one Province. Rates range from $25 yearly for the smallest cities to $500 yearly for the entire Dominion.

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Sturtevant

Proper Heating and Ventilation Increase Production

Proper heating and ventilation have a very direct bearing on production, for real efficiency is found only where working conditions are healthful.

One of the first requirements is pure air, and this can best and most economically be provided after consultation with Sturtevant sales-engineers. They know just what installation will give you pure air at lowest permanent cost.

Ask for folder 606

B. F. STURTEVANT CO.
of Canada, Ltd.
MONTREAL GALT TORONTO

Late News

Campbellville, Ont.
If the $5,600 debenture by-law to be submitted to the ratepayers on Feb. 8 is passed, work will commence at once on a Hydro electric lighting and power distribution plant. R. C. Menzies, chairman of the council.

Eston, Sask.
Tenders will be received until Feb. 16 for a sewerage disposal plant for the hospital. David Burns, secretary.

Fairville, N. B.
Sketch plans are being prepared for the Provincial Orphanage Board for an orphanage costing $30,000. G. W. Wilson, St. John, is the architect. H. Usher Miller, St. John, secretary.

Grande Prairie, Alta.
H. L. Shaver has the general contract for alterations to the Post Office costing $11,680.

Hamilton, Ont.
Thirty residences costing $112,000 are contemplated by Bethune & Dirks, 187 Ottawa St. N., owners and general contractors.

Little Current, Ont.
Provincial Government has commenced clearing the right of way for a road between Little Current and Espanola. Work is being done by day labor.

Lake Kenogami, Que.
At the end of January tenders will be called for an $18,000 dam. Commission Des Eaux Courantes, Department of Lands & Forests, owners, L. A. Richard, K.C., Deputy Minister.

Mont Laurier, Que.
Delegation has waited on the Chambre de Commerce asking its support to induce the C.P.Rly. to make an extension north of Mont Laurier.

Port Arthur, Ont.
Mutual Elevator Co. Ltd., Winnipeg, contemplate an elevator costing $1,000,000. S. T. Smith, president.

Regina, Sask.
Hebrew Free School contemplates a $30,000 building. Architects, Storey & Van Egmond, Regina.

Toronto, Ont.
Stores and apartments costing $40,000 are contemplated by J. D. Dickson, 1971 Yonge St.

City of Toronto will make sewer extension in the Danforth district. Tenders will be received until Jan. 30.

Vancouver, B. C.
General contract for the remodelling of an office building has been awarded to Smith Bros & Wilson.

Westmount, Que.
Tenders expected to be called about Feb. 28 on an apartment house costing $500,000. Bigonesse & Bigonesse, St Catherine St., architects.

Railroad Construction Approved

Railroad construction totalling one billion francs for next year has been approved by the Superior Railroad Council of France, which has general supervision over all systems. One-quarter of this amount will be devoted to electrification.

The Council also has promised to take measures to stimulate building by reducing freight rates on materials, the reduction to average twenty per cent.

·BULLETIN·№ 6·

·BURLINGTON STEEL·CO·LTD·

RAIL CARBON REAL STRENGTH

·HAMILTON·ONT·

THE · SPECIFICATION ·

IF YOU WISH TO PURCHASE

THE STRONGEST REINFORCING BAR ON THE MARKET, THE MOST ECONOMICAL STEEL BAR ON THE MARKET, THE BAR WHICH DEMANDS LEAST TONNAGE, THE BAR WHICH DEMANDS LEAST CONCRETE, WITH A METAL SUBJECTED TO A DEFINITE DISCARD IN ORIGINAL MANUFACTURE WITH A METAL SUBJECTED TO THE MOST CRITICAL INSPECTION BOTH CHEMICALLY AND PHYSICALLY IN ORIGINAL MANUFACTURE, WITH A METAL SUBJECTED TO THE MAXIMUM AMOUNT OF "WORK" IN MANUFACTURE, WITH A METAL WHICH GOES THROUGH A DOUBLE ANNEALING PROCESS IN SECONDARY MANUFACTURE, WHICH IS FREE FROM ALL INTERNAL STRESS WHEN DELIVERED AT THE BUILDING, WHICH AUTOMATICALLY PREVENTS INTERNAL STRESSES OR PERMANENT STRAINS DURING CONSTRUCTION, WHICH WILL WITHSTAND THE MOST ABNORMAL SHOCKS AND VIBRATIONS WHEN EMBEDDED IN CONCRETE, WHICH IS SUPERIOR IN EVERY PARTICULAR, CLEANER AND PURER, STRONGER AND MORE ECONOMICAL THAN ANY OTHER BAR,

THEN ALL YOU REQUIRE TO SAY IN YOUR SPECIFICATIONS IS:—

"CONFORMING TO THE REQUIREMENTS OF THE A.S.T.M. SPECIFICATION A16-14."

THE AMERICAN SOCIETY FOR TESTING MATERIALS IN 1913, AFTER SIX MONTHS MOST EXHAUSTIVE RESEARCH, WROTE THE FOLLOWING STANDARD SPECIFICATION, GIVING IT THE SERIAL DESIGNATION A16-14.

RAIL—STEEL CONCRETE REINFORCEMENT BARS

SERIAL DESIGNATION A16-14.

4 (a)—THE BARS SHALL CONFORM TO THE FOLLOWING MINIMUM REQUIREMENTS AS TO TENSILE PROPERTIES:

PROPERTIES CONSIDERED	PLAIN BARS	DEFORMED & HOT TWISTED BARS
Tensile strength, lb. per sq. in.	80,000	80,000
Yield point, lb. per sq. in.	50,000	50,000
Elongation in 8 in., per cent.	$\frac{1,200,000}{\text{Tens. str.}}$	$\frac{1,000,000}{\text{Tens. str.}}$

6-THE TEST SPECIMEN SHALL BEND COLD AROUND A PIN WITHOUT CRACKING ON THE OUTSIDE OF THE BENT PORTION AS FOLLOWS:

THICKNESS OR DIAMETER OF BARS	PLAIN BARS	DEFORMED & HOT TWISTED BARS
Under 3/4 in.	180 deg $d = 3t$	180 deg $d = 4t$
3/4 in. or over	90 deg $d = 3t$	90 deg $d = 4t$

NOTE:- d = The diameter of pin about which the specimen is bent.
t = The thickness or diameter of specimen.

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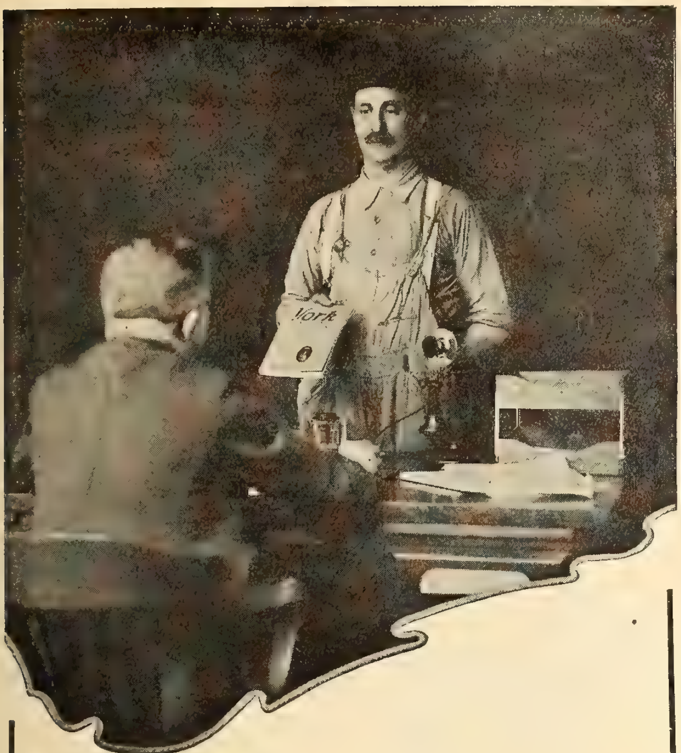

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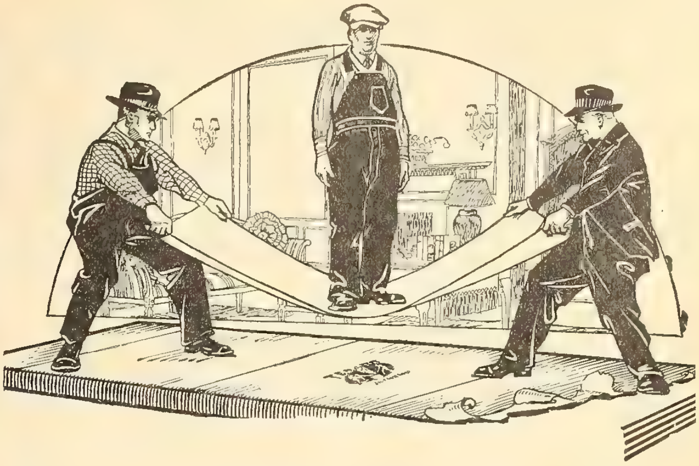

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Current Prices of Building and Engineering Materials

CEMENT (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Retail lots including bags	per bbl.	$4.60	$4.40	$4.80	$3.70
Car lots, including bags	per bbl.	3.35	3.68	4.16	3.35
Refund on bags	each	.20	.20	.20	

LIME (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Lump, in retail lots	per ton	14.30	14.00	.58 bu.	2.70 bbl
Lump, in car lots	per ton	12.70**	11.00	13.80 ton*	2.60 bbl
Hydrated, in retail lots	per ton	20.00	26.00	.60 bag*	30.00
Hydrated, in car lots	per ton	19.00	21.00	.54 bag*†	25.00

BRICK and TILE (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Common face brick	per M.	24.00	16.00*	19.00	30.00
No. 1 dry pressed brick	per M.	31.00	30.00	36.00	70.00
No. 2 dry pressed brick	per M.	29.00	25.00	32.00	
Enamelled brick	per M.	125 up to	230.00	185.00	150.00
Wire cut brick, for foundation work	per M.	21.00	19.00		50.00
Sand lime brick	per M.	17.00		18.00	
Hollow building tile	per M			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	60-95	60-75	85-100	80.00
Fire clay	per ton	13-20	15-16.00	35.00**	22.00

STONE, SAND and GRAVEL (f.o.b. cars on siding):—		Toronto	Montreal	Winnipeg	Vancouver
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.00 yd
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 "	" "
Crusher run	per ton	2.20½		3.00 "	" "
Rubble stone	per ton	2.45	1.70	15.00 cord	" "
Gravel, 2 in. screened	per ton	2.05		2.45 yd.	" "
Gravel 1 in. screened	per ton	2.31	1.50	2.75 "	" "
Sand, screened	per ton	1.42½	1.25	1.90 "	" "
Pit run	per ton	1.52¾	1.25	1.90 "	" "

STEEL and IRON (f.o.b. warehouse):—		Toronto	Montreal	Winnipeg	Vancouver
Mild steel bars, ¼ in. and heavier	per 100 lbs.	3.25 base	3.25 base	4.35	$4.00
Bands 3/16 in. and lighter	per 100 lbs.	3.75 "	3.25 "	4.85 base	
Hoops	per 100 lbs.	4.50 "	4.25 "		
Twisted and deformed bars	per 100 lbs.	3.35 "	3.25 "	4.20	4.00
Angles, channels and tees under 3 in.	per 100 lbs.	3.35 "	3.75 "	4.95	6.00
Structural shapes	per 100 lbs.	3.60 "	3.75 "	4.75	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.25 "	3.50 "	4.75	6.25
Plates—3/16 in.	per 100 lbs	3.60 "	3.85 "	5.15	6.50
Plates—10 gauge	per 100 lbs.	4.15 "	4.00 "	5.45	6.50
Black sheets—28 gauge	per 100 lbs.	5.00 "	4.50 "	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.20 "	6.00 "	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	6.20 "	6.50 "	7.70	8.25-8.50
Rivets	per 100 lbs.	5.75 "	5.50 "	7.00 base	
Cast iron pipe	per ton	60.00	55.00		

VITRIFIED CLAY PRODUCTS (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Sewer pipe, 4 in.	per ft.	.40	.30	.35	.28
Sewer pipe, 6 in	per ft.	.60	.45	.45	.48
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.55
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.70
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.85
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00	.90	.65	.75
Chimney tops	each	9.00	3.50–5.00	7.50	4.50–6.00
Discounts		45 % truck lots 50 % car lots	20 % 50 %	5 %	

CEMENT:—*Discount of 10 cts. per bbl. in 20 days. Price f.o.b. cars is $3.75 †Subject to 5% discount. **Excluding bags.
LIME:—*Discount of 5%. †Bag of 50 lbs. **Price f.o.b. cars is $11.70.
BRICK AND TILE—*f.o.b. plant.
STONE SAND AND GRAVEL:—*Winnipeg prices subject to 5% disco **Toronto prices include sales tax.

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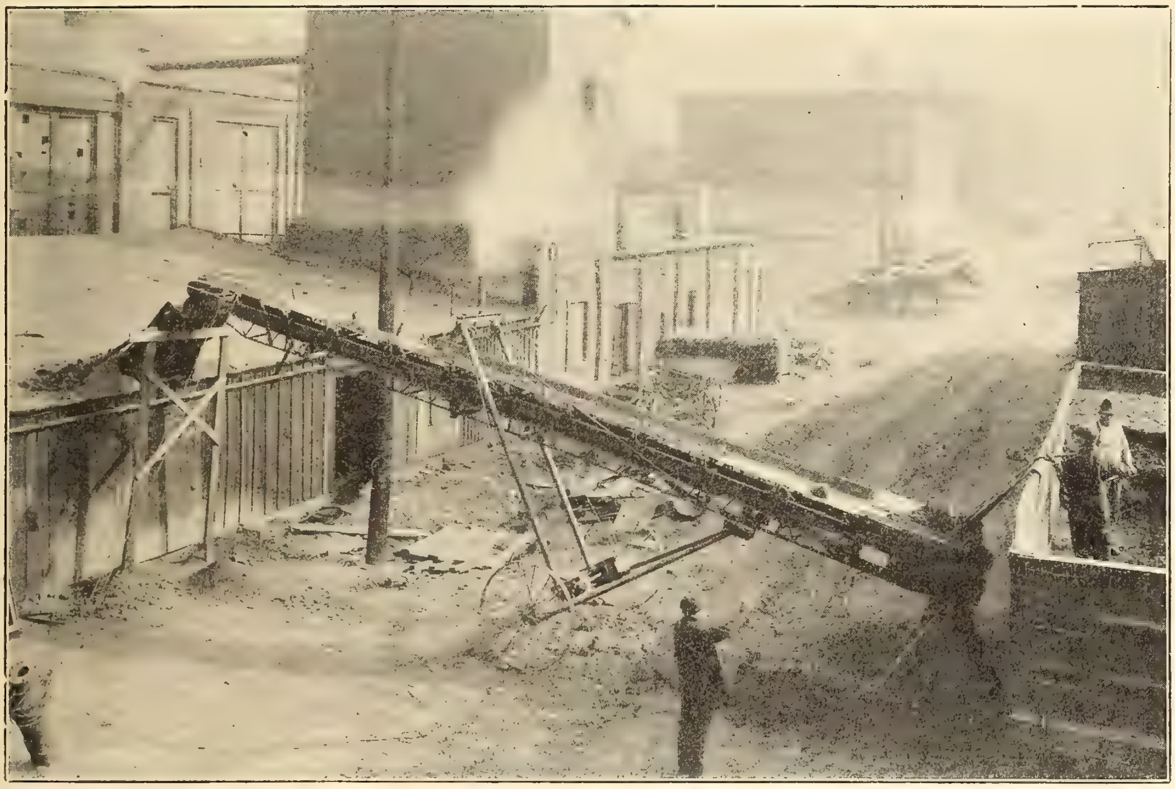

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CURRENT PRICES OF BUILDING AND ENGINEERING MATERIALS— continu

Lumber (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver*
Flooring, 1 x 3 and 4 in., clear, E. G. fir	per M.	100.00	60.00	84.00	55.00
Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	75.00	65.00	56.00	30.00
Flooring, No. 1 pine	per M.	70.00	80.00	64.80	
Flooring, No. 1 Spruce	per M.	45.00	40.00	39.60	
Flooring, birch and maple, 13/16 in. clear	per M.	130.00	110.00	152.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	130.00	125.00	140.00	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	75.00	60.00	56.00	30.00
V joint, No. 1 pine	per M.	70.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	43–58	45.00	63.75	
Pine, 2 x 4 to 12 in., common rough	per M.	50/55	70.00	36.00	
Hemlock, 2 x 4 to 12 in.	per M.	40-42.00	40.00	36.00	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	40–50.00	50.00	36.00	11.00-13.50
Spruce, 1 and 2 x 4 to 12 in.	per M.	41/46	45–35	36.00	
Timbers, fir, 10 x 10 in. and up	per M.	65.00	58.00	47.00 base	17.-22.00
Lath, No. 1 white pine	per M.	14.00	12.00	12.00	
Lath, M. R. spruce	per M.	10.00	8.50	10.00	7.00
Shingles, XXX B.C. cedar	per M.	6.35	5.00	5.25	3.40
XX B.C. cedar	per M.	5.00	4.25	3.75	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	108.00	55.00
Fir casing	per M.	1 ct. per in.	100.00	108.00	
PAINTS, OILS, COLOURS (delivered):—					
White lead ground in oil, less than ton lots	per cwt.	14.55	13.35	14.85	15.80
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	22.00
Putty in bulk	per cwt.	6.70	3.75	5.50.	9.25
Steel sash putty in bulk	per cwt.	7.20	6.00	8.75	7.75
Boiled linseed oil, in bbls.	per gal.	1.15	1.04	1.13	1.28
Raw linseed oil, in bbls.	per gal.	1.18	1.02	1.10	1.25
Turpentine, in bbls.	per gal.	2.25	1.95	2.15	1.60
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 4/5	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 1/5	.45
PLASTER (Delivered):—					
Hard wall plaster, sanded	per ton	13.50	15.00	25.00	30.00
Plaster of paris, in bbl. lots	per bbl.	6.00	5.35	1.60 bag*	7.50
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu.	1.50
LABOR:—					
Bricklayers	per hr.	1.00	.80–.90	1.15	1.06¼
Structural Iron Workers	per hr.	.85	.50–.75	1.25	1.00
Plasterers	per hr.	1.00	.80	1.05	1.06¼
Hoisting Engineers	per hr.	.70–.80	.50	.90–1.10	1.00
Plumbers	per hr.	.90	.60–.75	1.00	.90
Carpenters	per hr.	.80	.65	.90	.81¼
Painters	per hr.	.75	.55–.65	.80	.81¼
Electrical Workers	per hr.	.80	.65	.70– .90	1.00
Roofers	per hr.	.65	.65		.90
Laborers	per hr.	.40–.50	.30	47½–.55	.50–.56¼
Sheet Metal Workers	per hr.	.75			.90

LUMBER:—*Owing to the general unstable condition of the present lumber market, Vancouver dealers refuse to quote any prices at all especially for Prairie or Eastern publication. The prices are, moreover, fluctuating from day to day. Such prices as we quote are, therefore, averages and not standard.

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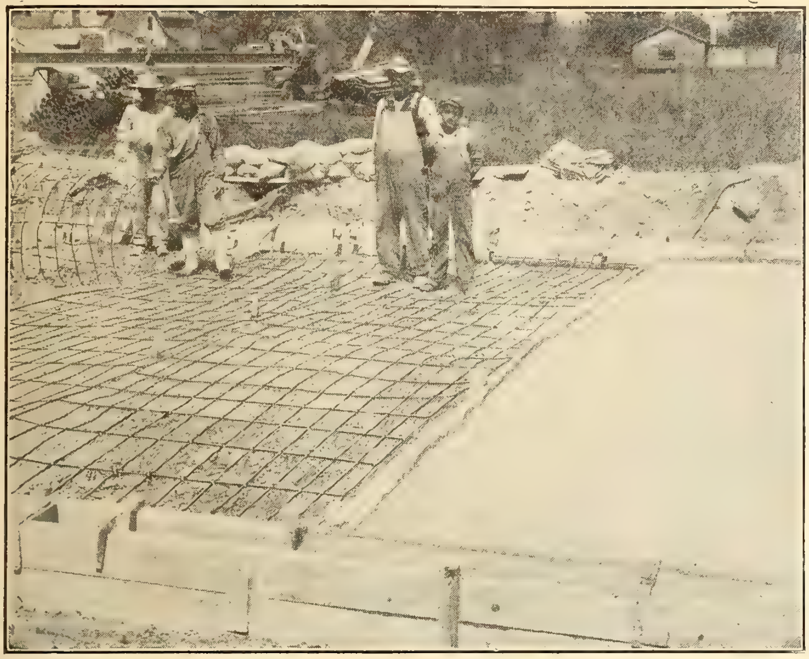

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DEPARTMENT OF LABOUR

BOILER INSPECTION NOTICE

Excerpt from Regulations for the Construction and Inspection of Boilers

Section 300

No Boiler which has been in use for two or more seasons shall be sold or exchanged for subsequent use as a Boiler unless it is accompanied by an inspection certificate issued by the Department within one year preceding the date of such sale or exchange. The allowable working pressure for such Boiler shall be determined by the Inspector from the formulæ contained in the regulations, with such deductions in pressure for depreciation as the Inspector's judgment shall dictate.

The travelling expenses in connection with the inspection of Boilers sold, exchanged or extensively repaired, must be paid by the owner or purchaser of such Boilers, together with the inspection fee of five dollars.

All communications should be addressed to the Steam Boiler Branch, Department of Labour, Spadina Crescent.

HON. W. R. ROLLO,
Minister of Labour.

D. M. MEDCALF, Chief Inspector of Steam Boilers.

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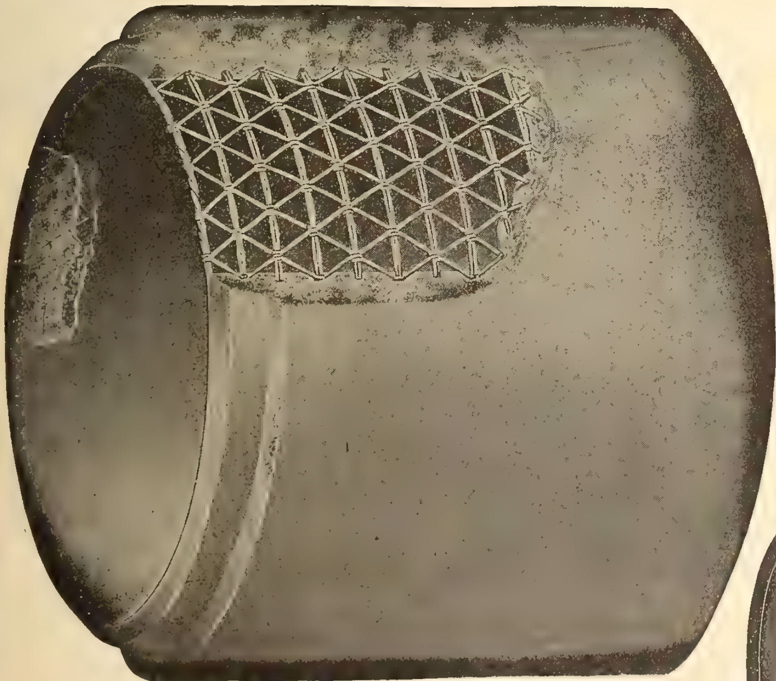

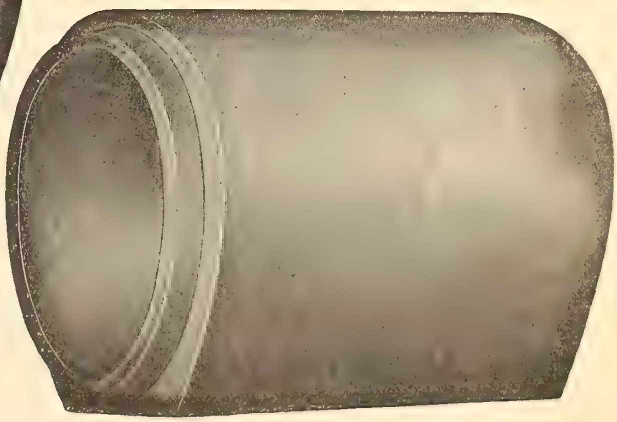

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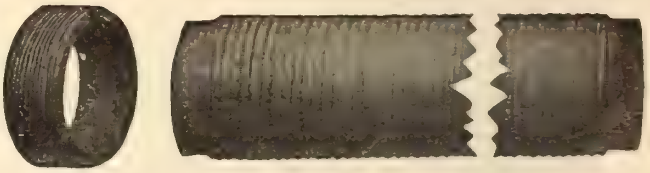

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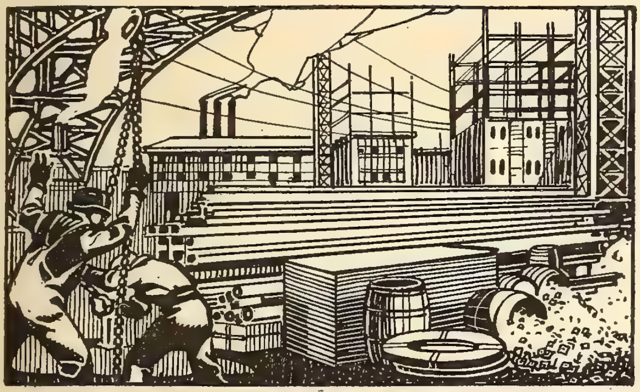

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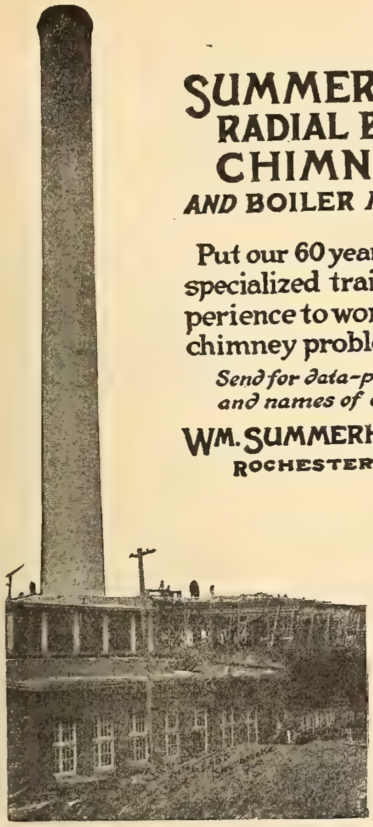

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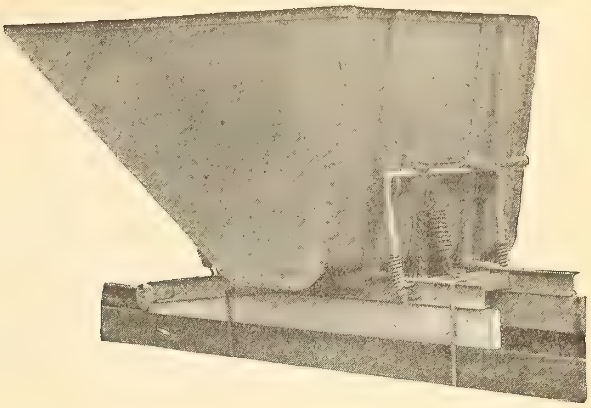

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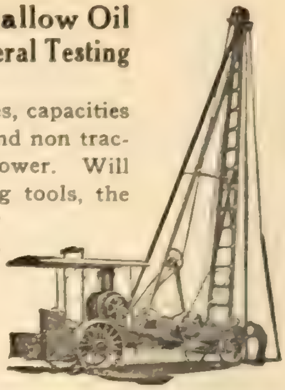

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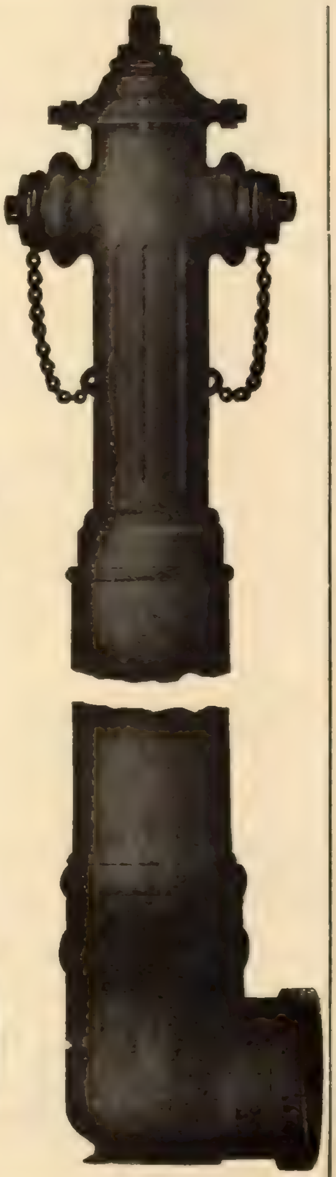

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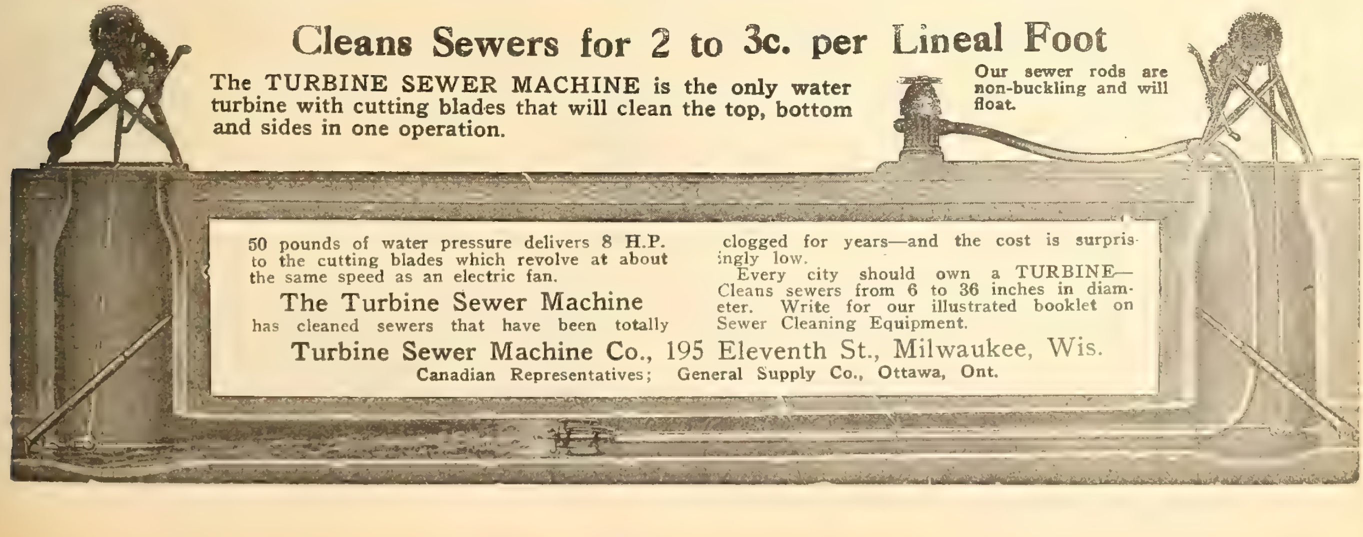

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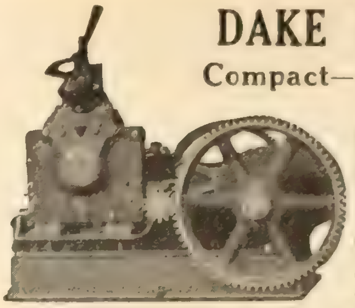

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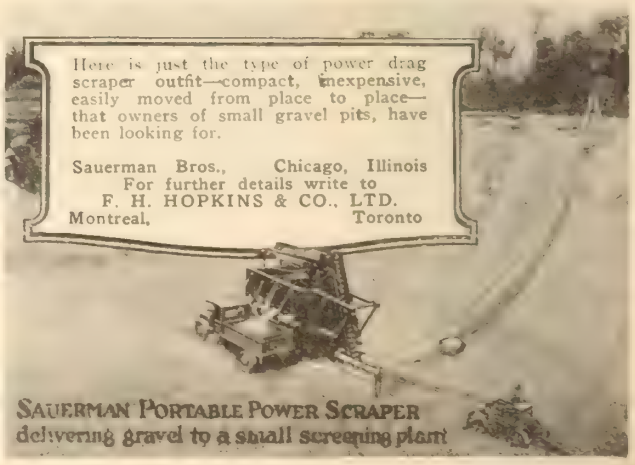

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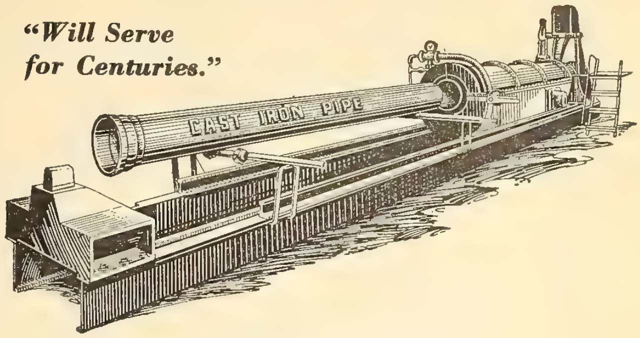

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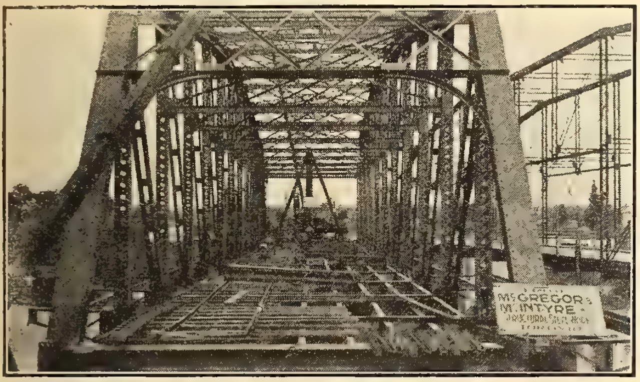

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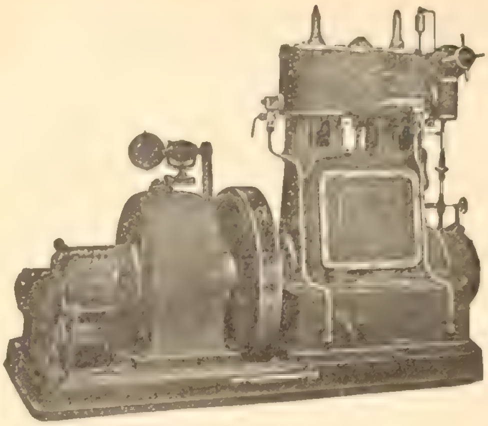

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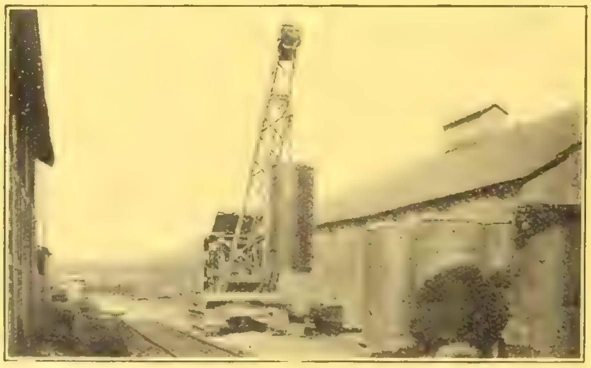

The "Marion" Revolving Shovel with the 8 cubic yard Dipper

gave excellent service—at all times—proving that it pays to install the best equipment available when the undertaking is so important.

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Vol. 37 Toronto, January 31, 1923 No. 5

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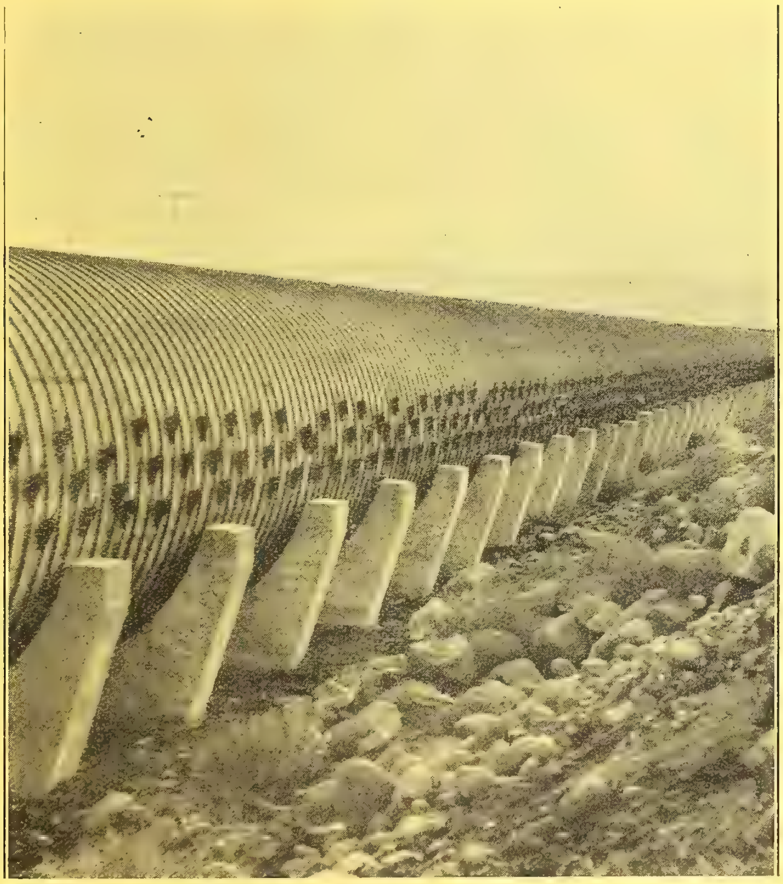

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2 to 24 inches diameter

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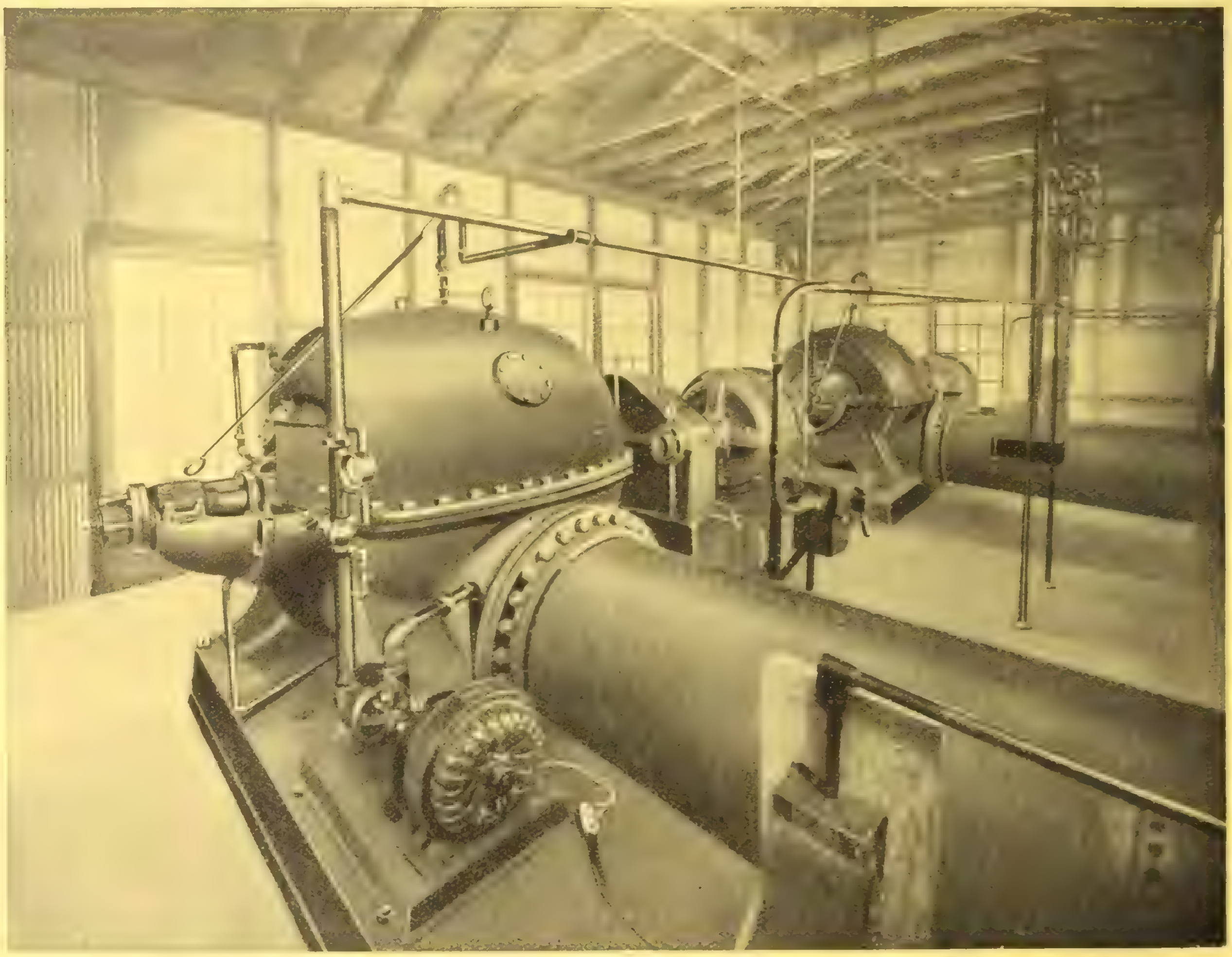

Showing two 30″ Rees Roturbo Pumps, (23,000 Imp. Gals. per minute) at the Maple Ridge Dyking District.

REES RoTURBo PUMPS ARE SELF REGULATING

They automatically adjust themselves to sudden Drop or Overload without injury to themselves or the prime mover, and they assure a high and constant efficiency over a wide range of duties.

Municipal and Industrial Plants all over Canada are installing REES RoTURBo PUMPS.

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are a staple article. **Thousands of contractors** who operate their own plants have found this the most profitable branch of their business. It provides work for their men during winter months and will provide a source of income the year around.

IDEAL CONCRETE BLOCK MACHINES
THE WORLD'S STANDARD

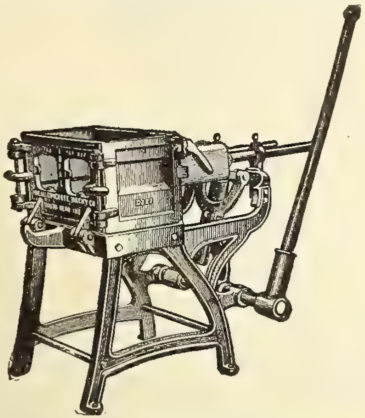


Fig. 910
The Ideal Concrete Block Machines stand supreme the world over, and the Ideal Concrete Blocks are accepted as the standard for Concrete Block Construction by Engineers everywhere.
The Ideal Block Machine makes every style of block required.
—Fully described in Catalogue No. 22-B-1

The Ideal Concrete Block stands supreme the world over. They are made in any size, shape or design to suit the most exacting Architect or Engineer. One of the most recent developments is that of making blocks to receive stucco finish, which is very popular in house construction.

LONDON CEMENT BRICK MACHINE
Hand Power

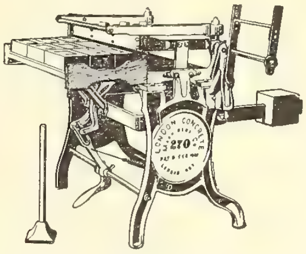
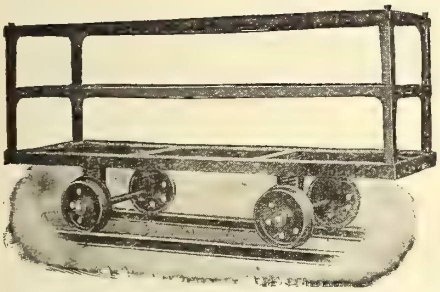


Fig. 91
Capacity, 5,000 bricks per day. Makes brick with smooth faces on all sides and with frog impression. This is the best hand-operated cement brick machine on the market. Brick can be made on the ground where building is to be erected. There are big profits in the manufacture of Cement Brick.
—Described in Catalogue U.

Cement Brick are in good demand in many localities where building materials are required. They are suitable for all classes of construction and can be profitably made without a large expenditure.



We Make a Full Line of Brick, Block and Tile Cars. Prices on Application
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LONDON CULVERT TILE AND SEWER-PIPE MOULDS

Made in all Sizes From 4 in. to 72 in.

Our moulds are made on designs approved by Engineers. There are large profits in making Culvert Tile and Sewer Pipe.
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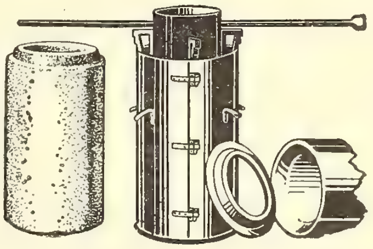

Fig. 95.

London Tile and Sewer Pipe Moulds have been used to make concrete tile for every large Municipal Sewer contract in Canada within recent years. They make tile in all sizes from 4 inches up to 10 feet in diameter.

Made in Canada

We manufacture Concrete Mixers, Hoists, Air Compressors, Pumps, Brick, Block and Tile Machines, Barrows, Carts, Silo Moulds, Ornamental Moulds and Tools.

The London Concrete Machinery Co., Limited

Dept. 7 London, Canada

World's Largest Manufacturers of Concrete Machinery

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Remixes Concrete

When materials have passed through mixing process once, and come to discharging side of the drum, the reversed discharge chute sprays them back to the charging side for repeated trips through the 5-action, remixing process. This spraying-showering action, at the same time prevents separation of aggregate according to size. To the last shovelful of every batch, Koehring-mixed concrete is uniform, re-mixed concrete—***dominant strength concrete***—and to every last casting and bearing, the Koehring is the heavy duty mixer of trouble-proof, long service life.

Capacities

Construction Mixers: 10, 14, 21, 28 cu. ft. mixed concrete. Write for Catalog C **28**

Pavers: 7, 10, 14, 21, 32 cu. ft. mixed concrete. Write for Catalog P **28**

Dandie: Light mixer, 4 and 7 cu. ft. mixed concrete; power charging skip, or low charging platform. Light duty hoist. Write for Catalog D **28**

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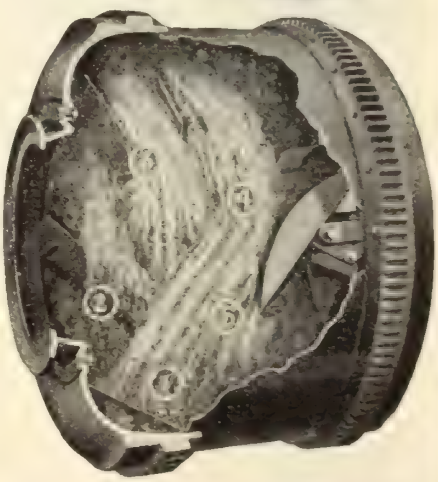
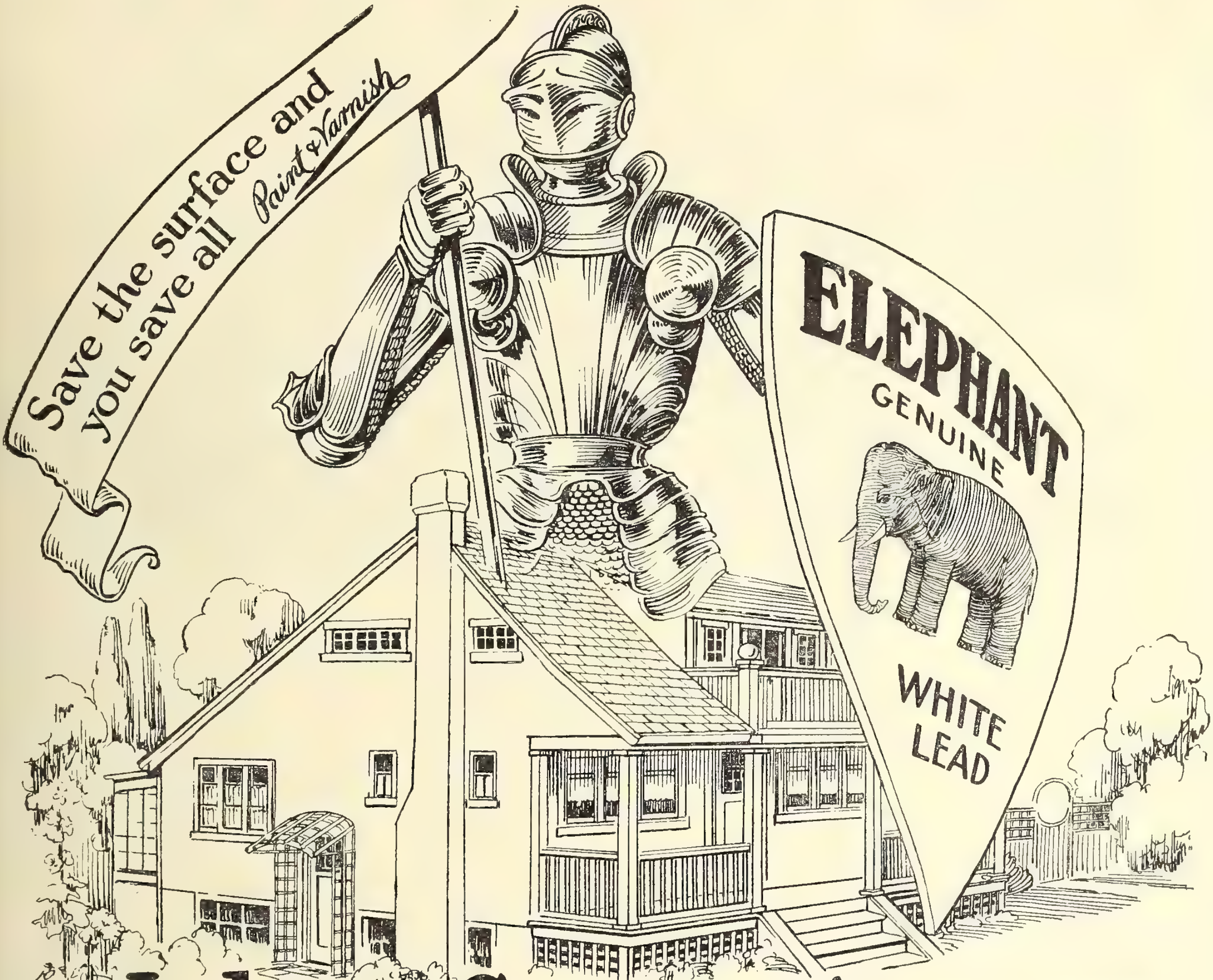


(1) Blade cuts through materials with churning action. (2) Blade carries materials up, spilling down again against motion of drum. (3) Materials hurled across diameter of drum. (4) Materials elevated to drum top and cascaded down to reversed discharge chute which (5), with scattering, spraying action, showers materials back to charging side for repeated trips through mixing process.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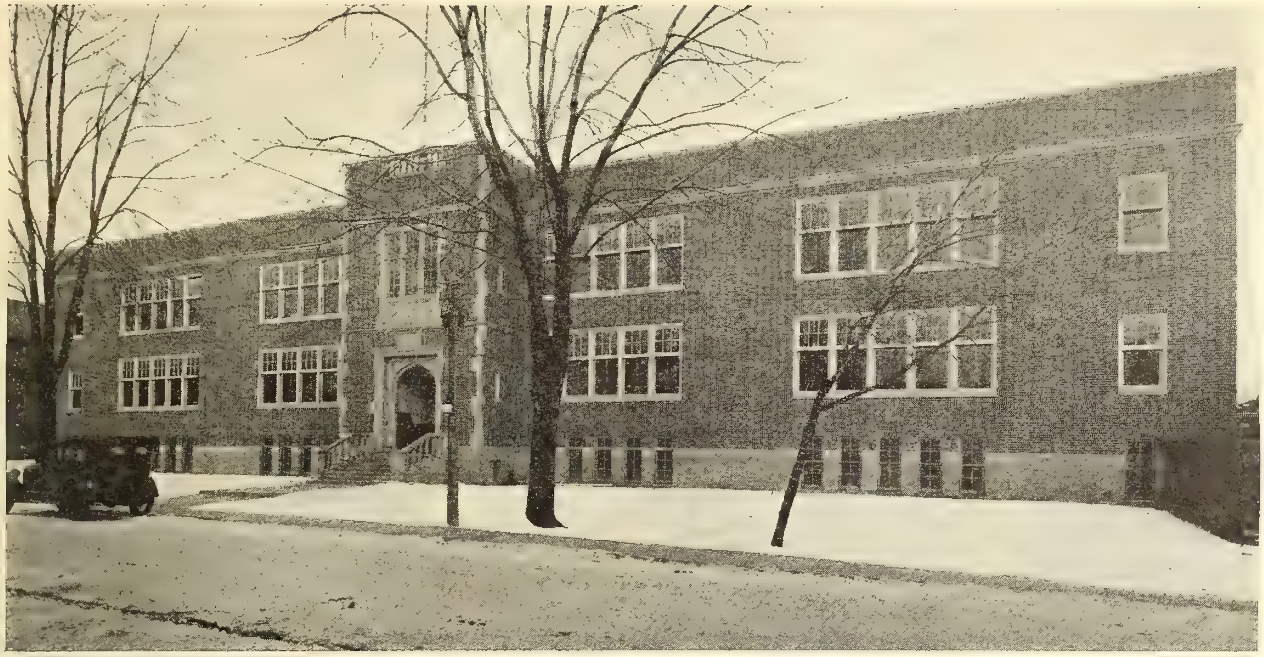

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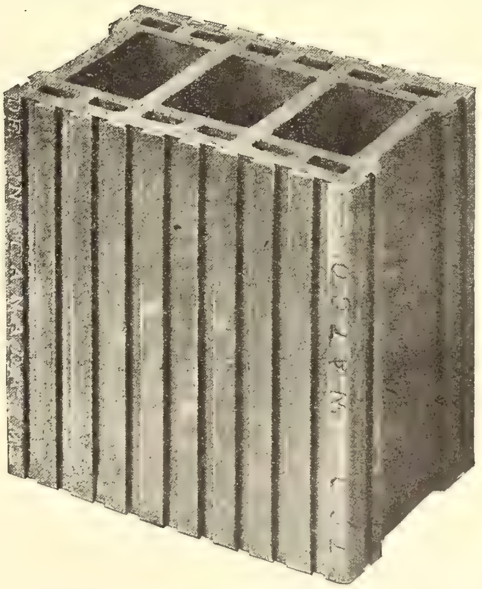

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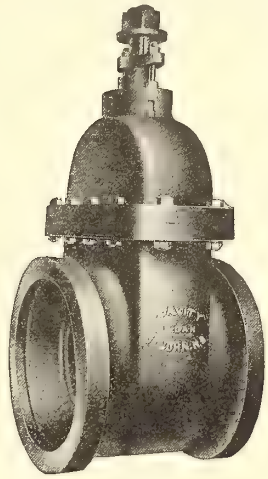

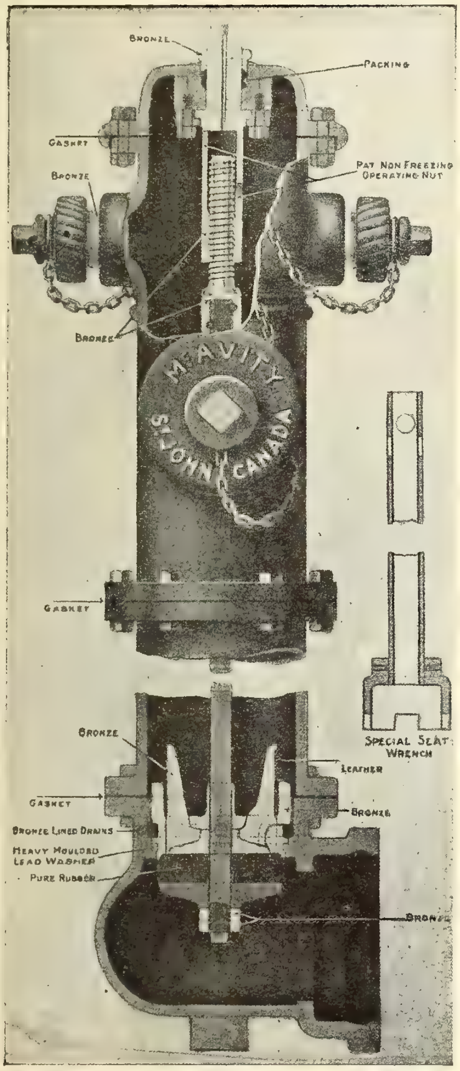

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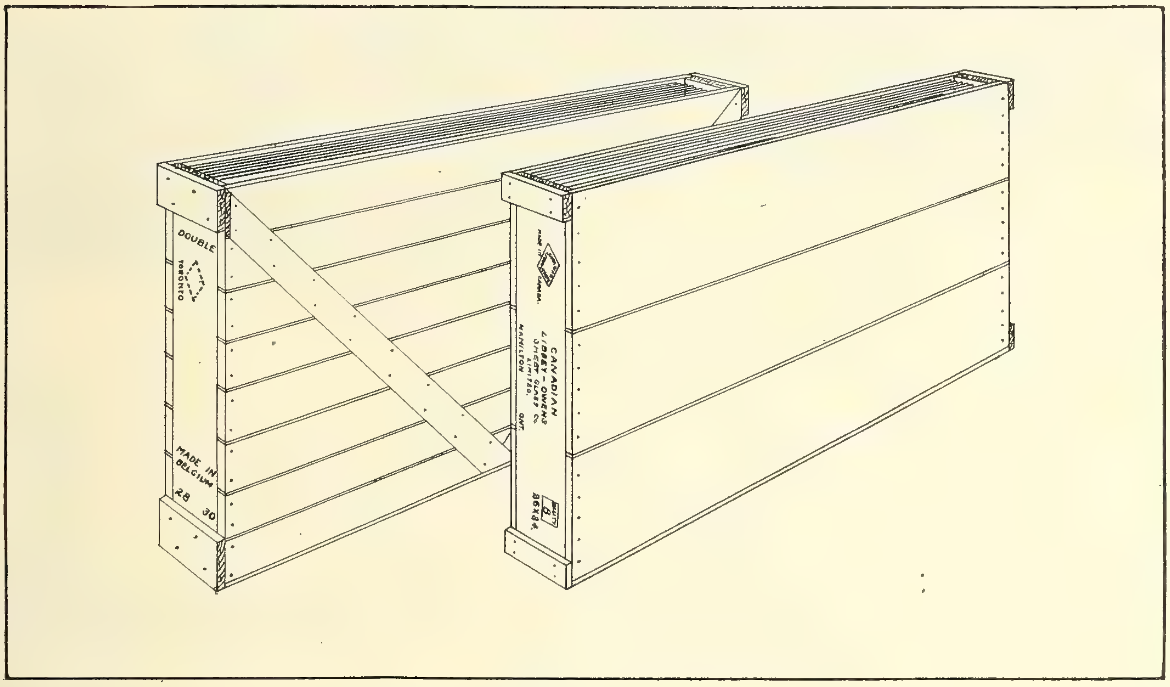

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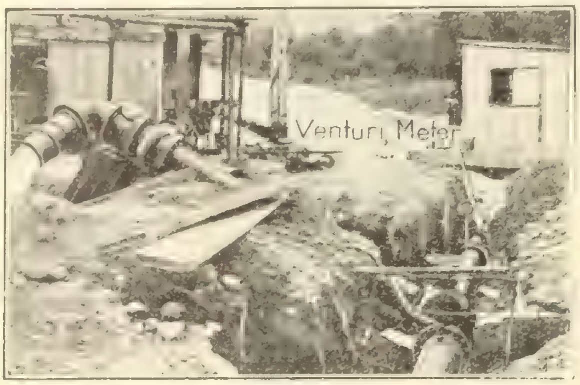

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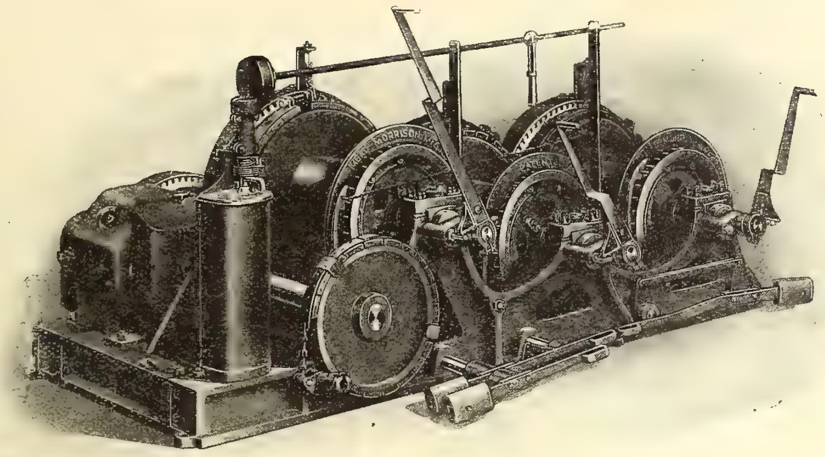

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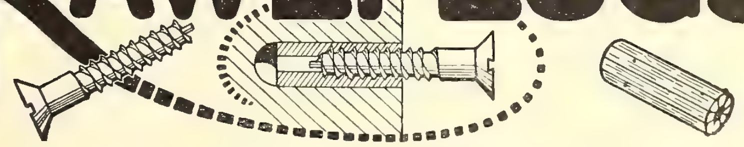

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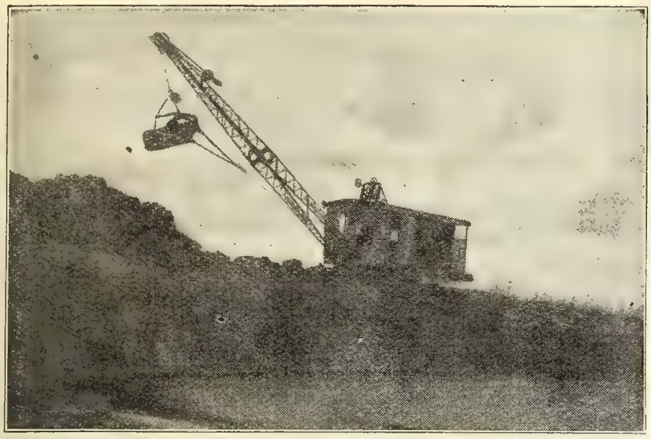

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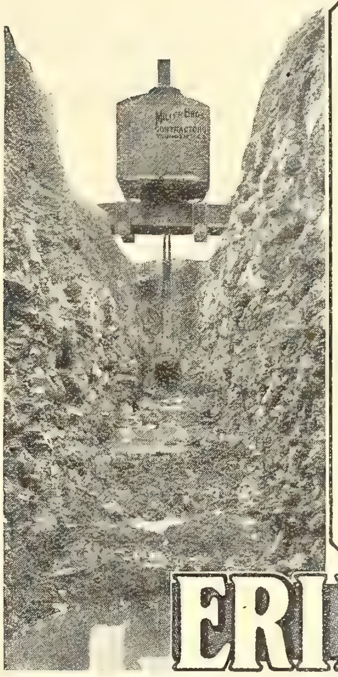

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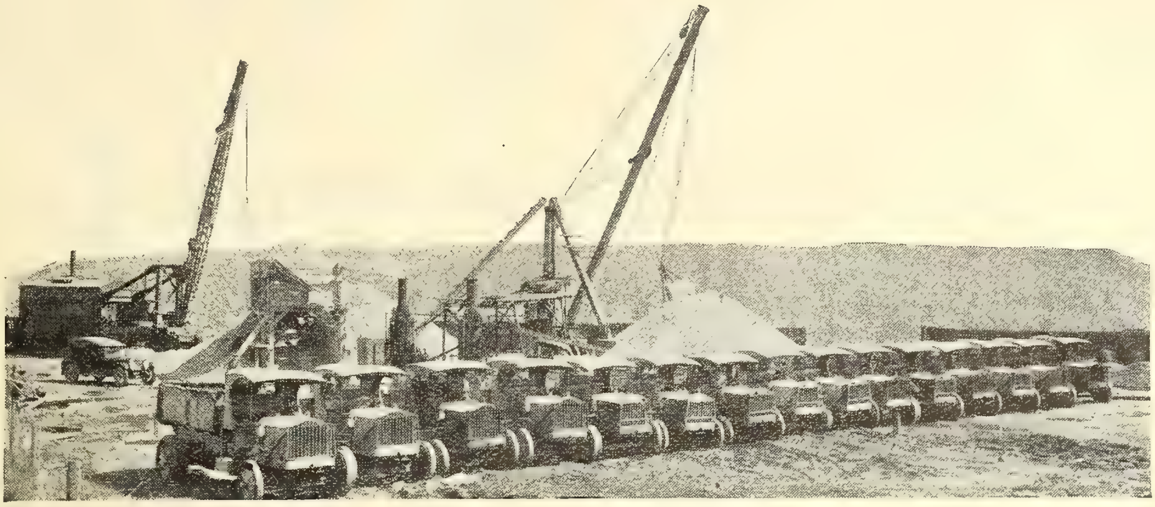

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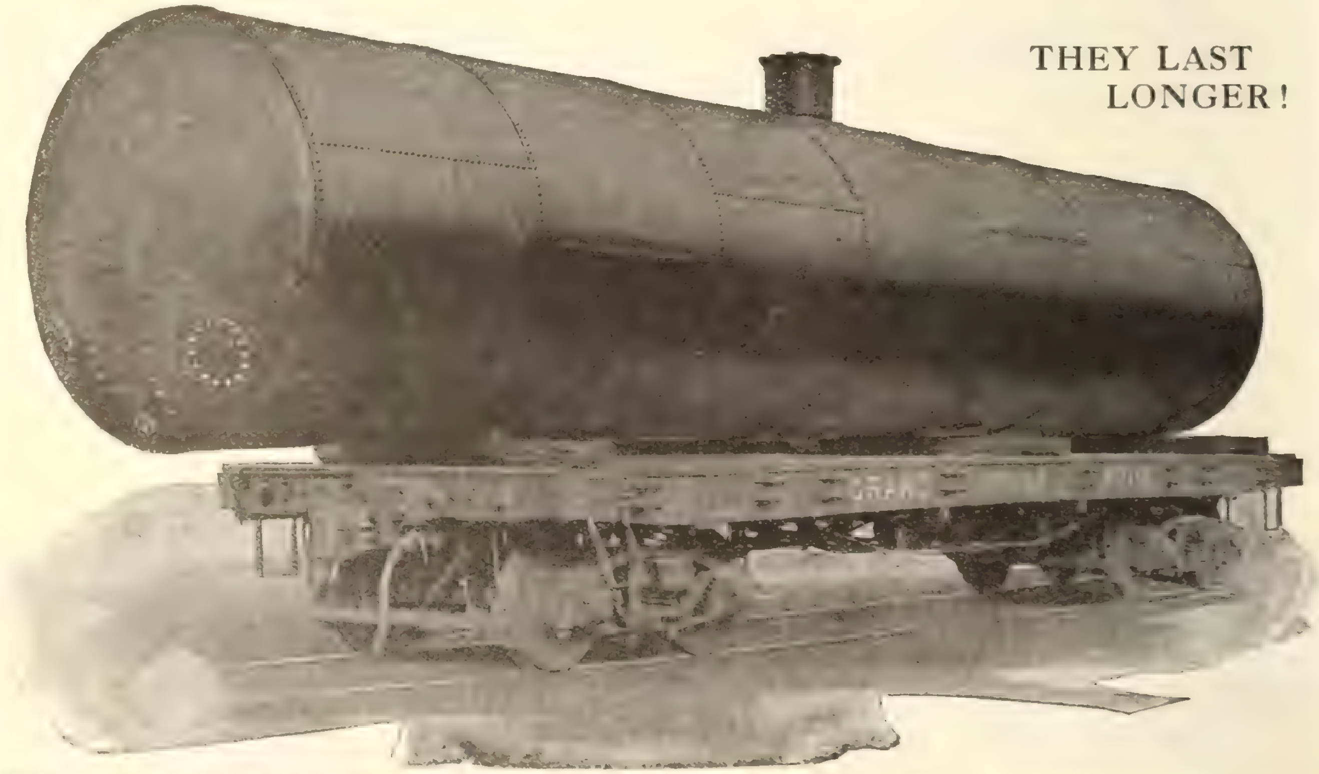

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Juggling the Wage Scale

One of the many difficulties that confront the builders of the smaller towns is competition from the larger construction organizations of the big cities. What these local contractors have to fear is, generally speaking, not so much the fact that outside constructors take jobs that might well have been handled by home talent, but that in doing so, the larger organizations frequently make a strong bid for the available labor by offering wages in excess of the accepted scale. By such a procedure, the pick of the labor naturally drifts to the more generous employer and the local builder is left stranded or else is forced to offer similarly inflated wages. Furthermore, the scale, having been established on the higher basis, often tends to remain at that pitch even after the non-resident contractor completes his job and releases his labor for local service again.

The small town builder, as a rule, does not object to the awarding of local contracts to outside contractors, especially if they win them on the basis of a competitive tender. Of course, in some instances, local sentiment runs so high that strenuous objections are raised to the awarding of any work, especially of a public nature to non-residents. But there are cases where the local builders are quite content to let outsiders handle certain jobs which demand a large organization, a breadth of experience and sound financial backing. On what they base their objections, however, is the tendency that has often been noted of these larger organizations to get an assured labor supply by raising wages, leaving the local employers without sufficient men to carry on their own work for which they tendered on the strength of the regularly accepted wage scale.

This objection is well founded, for in many instances large firms have shown no disposition at all to adhere to labor agreements that were the basis of all local work and, in consequence, the smaller men have had to suffer. Fortunately, all of the big contractors have not been so selfishly inclined and the condition alluded to has been avoided by a mutual discussion of the labor situation before the outside contractor actually started work. Such a consultation between the local and non-resident builders, in helping to prevent any undue inflation of wages, would make for a better spirit of co-operation between them.

This situation was made the subject of a resolution at last week's meeting of the Provincial Builders' and Supply Association. It was worded as follows:

> "Whereas some instances have been noted of undue inflation of wages by outside contractors,
>
> "Therefore, be it resolved that non-resident contractors be requested to always consult the local contractors or their association so that not higher than the prevailing wage scale will be adopted as applying to local men employed by such non-resident contractors, this not to apply to men brought in by the contractor and who are not regular residents of the locality affected."

This resolution seems to meet the requirements of the case and if its spirit were accepted by all of the large contractors who are awarded jobs in smaller municipalities, there would be less antagonism shown to outsiders by local interests. Provision is made, it will be noted, for non-resident labor to be employed without regard to the local wage scale. This is to take care of the more or less permanent staff which every big organization carries and which receives wages that are based on the wages prevailing in the city where the firm makes its headquarters.

Looking After the Contractor's Interests

To keep an eye on legislation affecting the construction industry that is either proposed or passed is one of the chief functions of the Provincial Builders' and Supply Association—the organization that is representative of the building business of Ontario. This duty it performs very well and it is quite safe to say that where it not for the interest which the association takes in legislative matters, there would now be on the provincial statute books, laws that would be seriously inimical to the industry. The fact that the association has been awake to the interests of the contractors has led the government and many of the departments to seek its advice regarding matters that affect building. Thus on the lien and workmen's compensation questions, the Provincial Builders' and Supply Association has been regarded as the mouthpiece of the contractors of the province and official recognition has been given to its opinions by frequently asking representatives of the association to sit on boards or committees. The results which such participation has been responsible for have justified the keen interest that the association has taken in legislative questions. It is a matter for which the contractors ought to be thankful that they have an organization that is alive to their interests in this way.

Montreal Contractors Take Steps to Ensure Year-Round Construction

In furtherance of the "building all the year round" movement a committee of leading builders, consisting of Messrs. D. K. Church, president of the Builders' Exchange; Douglas Bremner, president of the General Contractors' Association ot Montreal, and W. E. Ramsay, a director of the Builders' Exchange, waited on the Board of Governors of McGill University on January 15. The delegation was received by Messrs. E. W. Beatty, K.C., Chancellor of McGill; General Sir Arthur Currie, principal and vice-chancellor, and the following governors:—A. J. Brown, K.C.; William M. Birks, John W. Ross, and A. P. S. Glassco, registrar.

The objects of the visit were set forth by D. K. Church and Douglas Bremner. They stated that they wished to ask the Building Committee of McGill University if they would co-operate with other bodies in bringing forward their building programme for the coming season as well as for succeeding seasons as early in the year as possible with a view to relieving difficulties caused by the present practice of letting such contracts late in the summer instead of early in the year.

Under present practices, said Mr. Church, builders and their employees had to face a shortage of men toward the end of each summer season, with a shortage of work during the winter. The result was that toward the end of each building season, when they were most needed, the skilled mechanics started leaving Montreal for New York or Cuba, or other places, where they secured employment far the winter at good wages, and only returned to Montreal in summer, when the regular building season got well under way.

Best Building Months Lost

Large corporations, said Mr. Church, were accustomed under the present system to calling tenders for their building programmes in May so that by the time arrangements were made and contracts awarded the end of June was in sight, which meant that the contractors lost the three best building months in the year, April, May and June. Further he said, at the beginning of such building operations the contractors mainly needed large numbers of unskilled men to start things going, so that it would be the middle of the summer before there was employment for the skilled men, such as plasterers, bricklayers, stone masons, etc.

On the other hand the firms supplying materials, such as stone cutting plants, brick plants, cement, and similar works were largely shut down during the winter. This resulted in a great rush for building materials in the summer just about the time the shortage of cars with the movement westward for the harvest commenced.

Mr. Douglas Bremner, for the General Contractors' Association enlarged upon these points, and urged that there would be no increase in cost if building programmes were brought out as early in the year as possible. The actual cost of winter work, he said, was somewhat greater, but this was more than offset by the greater efficiency of the workmen, who were anxious to secure and hold jobs. Modern practice had shown that building could be carried on as well in winter as in summer, so far as the buildings themselves were concerned.

The contractors, he said, were now simply working in their own interests, because they believed it in the interests of the employees and of the city generally that building operations should be continued all the year round, instead of, as at present, being confined to four or five months of rush work. This would also prevent a present serious depletion of the ranks of shilled building artizans, as owing to the natural reluctance of men to learn trades which offered employment only for a few months in the year, the places of men dropping out were hard to fill, while a certain proportion of the mechanics who went away for winter work did not return. For these reasons the committee wished to urge upon the McGill authorities that they get any contemplated building work under way as early as possible.

Governors Approved Plan

Both Mr. E. W. Beatty and Sir Arthur Currie replied for the Board of Governors. They stated that they were entirely in sympathy with the movement that had been outlined to them, and saw no reason why anyone should be unwilling to co-operate with the plans outlined by the builders' committee.

As to their own building programme at McGill, however, they stated that this had not yet been arranged, so they could not on the spur of the moment say definitely what they would do. They promised to give the propositions put before them serious consideration, feeling that the movement was one for the good of the whole community.

The committee has already interviewed the Board of Trade and the School Commissioners, in each case receiving an encouraging reception and promises of co-operation in their work. They intend to continue and call on other bodies that have large building programmes, to urge the extension of the building season.

The steel superstructure frame for the new Montreal Court House addition is in process of erection. The fabrication and erection are being undertaken by the Dominion Bridge Co., of Lachine, Que.

The Program of the Construction Conference to be Held at the Chateau Frontenac, Quebec, February 6—9

Under the Auspices of the Association of Canadian Building and Construction Industries

Tuesday, February 6th

10.00 a.m.—Registration of Delegates.
11.00 a.m.—Meeting of National Council and Executive Committee.
1.00 p.m.—Luncheon; civic greetings, and special speaker.
3.00 p.m.—Business session; president's address; reports.
4.00 p.m.—Address by James Mackie, "Western Conditions."
5.00 p.m.—Committees meet for organization.
Evening—Curling, and French Operette, direct from Paris.

Wednesday, February 7th

10.00 a.m.—Address by J. P. Anglin, "Seasonal Employment in the Construction Industry."
10.30 a.m.—Discussion.
11.00 a.m.—Address by J. M. Pigott, "The Shortage of Mechanics and the Cure."
11.30 a.m.—Discussion.
1.00 p.m.—Luncheon; Speaker, Hon. Antonin Galipault, Minister of Public Works, Quebec.
2.00 p.m.—Tour over new Chateau Frontenac buildings, conducted by C. D. Harrington
3.00 p.m.—Address by E. G. M. Cape, "Construction Activity in Canada, 1923".
3.30 p.m.—Discussion.
4.00 p.m.—Address by John V. Gray, "Right Relations With Our Workmen."
4.30 p.m.—Discussion.
5.00 p.m.—Meetings of committees.
Evening—Curling or sliding.

Thursday, February 8th

10.00 a.m.—Address by J. A. Schryburt, of the Bureau of Statistics, "The Industrial Census Schedule."
10.30 a.m.—Address by R. J. Fuller, "Why and How to Find Costs."
Discussion.
12.00 a.m.—Illustrated Talk, "The Quebec Bridge," by George Porter, Esq.
1.00 p.m.—Luncheon. Speaker, Hon. Athanase David, Provincial Secretary.
2.00 p.m.—Trip to Quebec Bridge by special train, C.N.R.
5.00 p.m.—Committee meetings.
8.00 p.m.—Smoker, with programme provided by Quebec Association.

Friday, February 9th

10.00 a.m.—Address by Charles W. Wallour, of Babson's Statistical Agency, "The Outlook for 1923."
Discussion
General business; committee reports.
1.00 p.m.—Luncheon; musical programme.
2.00 p.m.—Concluding session; installation of new officers.
8.00 p.m.—Hockey match.

Every day and evening, exhibit of materials and up-to-date appliances by manufacturers and supply members

McGill's New Biological Building

A Complete Description of the Architecture, Design Features and Construction Factors Involved in the Building for the Biological Sciences of McGill University—The Methods Used by the Contractors

Some fifteen years ago McGill University was visited by a series of disastrous fires, following closely on each other, which wiped out several of their larger and more important buildings. One of the buildings thus partly destroyed was the Biological building, though they were fortunate enough to save at least half of it which they continued to use. It was only within the past year or two that the Board of Governors decided that the need for larger quarters could be successfully financed. This new building is one of the monuments to the generosity of those who contributed to the Centennial Campaign Fund, and as they view the results they should feel satisfied that their open handedness has not been misplaced. The new addition has been erected on the site formerly occupied by that part of the old building which was burned. It is situated just inside, and to the right, of the University St. entrance to the grounds and just across the road from the Engineering building. The present Engineering building is comparatively new, it having replaced the one destroyed in the fire.

Topography of the Site

The ground at this point slopes down quite steeply from north to south, it being really part of the original slope of the Mountain. The grade of the road which runs up along the east side of the building is about 1 in 10. The main entrance of the former building was on the north side and ground floor level and ground level were at the same elevation, but in the short distance traversed by the length of the building it required a flight of steps down to the exit at the south end. This topography continues throughout the length of the new addition there being a further descent at the south end of the new building before one reaches the exit. This natural condition had considerable influence on the architects when the design of the new addition was undertaken. The ground was more nearly level in an east and west direction.

Design of the New Addition

The plan of this new addition is in the form of a T with the base or perpendicular leg of the T joining onto the end of the old building. The ground floor or 1st floor of the old building is at the same elevation as the second floor of the new addition and the main corridor continues in a straight line through both the old and the new buildings and on the same level. This is the only instance where any floor of the old building is found at the same elevation as the floor in the new addition. The reason being that the architects considered the fact that the building would be principally devoted to the installation of laboratories, and their constant use would require a room of greater height to provide more chance for abnoxious fumes to dissipate. It would follow from this that the floors become more widely separated as one ascends and this difference in elevation has been overcome by a flight of steps connect-

General view of the completed building taken from the front ing the corridors of the new addition with those of the old building.

In giving the dimensions of this new addition the nearest foot only will be used as absolute accuracy is not necessary to an inch. That part of the building which runs in a direction north and south is 60 feet wide by 138 feet long, measured along the main corridors. The other section of the building which appears as being a newer addition is 86 feet long and 35 feet wide, the latter distance being in the north and south direction. Viewed from the exterior these two sections appear as though they might have been built at different times, the smaller or southern section appearing to be a still larger addition than the intermediate section. The distance between the floor levels is 14'-0". The area of the basement floor is not as large as the area of the floors above for the reason that the basement was stopped midway in the building to permit natural light to reach all rooms. (See paragraph on topography of the site). Each floor has a main corridor traversing the full length of the building and ending at a pair of doors leading into the front part of the building. The stairs connecting the floors are at both ends of the corridors, of the reverse type with a landing half way up the ascent. On each landing a door leads into a small lavatory at the same elevation. These are for the use of the staff only. The men's lavatories are at the south end of the building and the women's at the north. Besides these small lavatories there are two main ones in the basement for the use of the students. There is one for each sex. The class rooms and various laboratories are all entered directly from the main corridors on each floor. The laboratories are of various sizes and types depending upon the nature of the work for which they are being used. Their construction and appointments also vary for this same reason. This will be commented on in a following paragraph. There are connecting doors between the laboratories and the classrooms, of oak veneer on birch, without glass, and of the flat hospital type.

There are large locker rooms in the basement, for the use of both sexes, containing steel lockers of a modern type.

Distribution of Interior Space

The ground floor of the front section and the basement of the intermediate or main section are at the same elevation. This is generally known as the ground floor and no mention of basement is made.

The total area of the ground floor of the front section is at present being used as a lecture theatre though it had been originally intended as an entrance hall. The south entrance, or main entrance, leads into this room by 3 steps down to floor level from vestibule level. There is an aquarium in each window supported on iron pipe framing to the floor and the radiators are directly underneath. Students lavatories, male and female, are slightly raised above this ground floor level (3 steps) and have locker rooms in the same room. Lavatories have marble furnishings and porcelain plumbing of best kind, including basins, etc. There is a terrazzo floor in both lavatories, also a 6" terrazzo baseboard. The plaster has been tinted a light buff and the ceilings painted battleship gray with a smooth glossy finish. There are a large number of closed-in steel lockers set up in sets of six. Each student has his individual locker. The girls' locker room is smaller than the men's in proportion to the comparative enrollment.

All the mechanical, electrical and heating apparatus is further back in the basement and is reached by a hallway which separates the two cloakrooms and lavatories. This entrance is usually locked.

Botany Floor

The first floor is called the Botany floor, being devoted almost entirely to this particular branch of work. The area in the front section on this floor is one big lecture room and laboratory with a small conservatory at the west end. This conservatory has been built outside the main wall of the building and contains many different kinds of plants. There are several aquaria containing water plants for experimental purposes and fish for ornamental purposes. There are 2 or 3 aquaria containing fish for experimental purposes also. This room is equipped with a series of long tables and benches where studies and experiments are carried on. Two large Alberene sinks one on each side of the door are also used in the work going on here. The floor is of selected birch laid on asbestos fill. The area in the main building on either side of the corridor is devoted to professors' offices and private laboratories, stock rooms, photographers' rooms and other small laboratories.

The second floor is devoted to the class rooms and laboratories used in following the study of Zoology, the division of the space being much the same as on the floor below. Here also the professors have their offices and private laboratories.

The third floor has been given over to the work in connection with Bio-Chemistry. It is on this floor that the largest number of fume cabinets is found, the main laboratory in the front of the building being equipped with 12 cabinets. The object of these cabinets is explained in a later paragraph.

The fourth floor is devoted entirely to the work in connection with the study of Physiology except for the front section where we find the departmental library, 2 private laboratories and a stock room for storing chemicals and apparatus. The main physiology laboratory is on the east side of the corridor in the main section about half way in the corridor. It is completely equipped with apparatus and has the fume cabinets.

The top floor which comprises the area of the main building only is set aside for the study of Pharmacology.

Most of the sinks in the laboratories are made of Alberene with the same material as a draining board. These are supported on iron pipe frames.

There is a side entrance to the new building entering from the east side at the junction of the new addition and the old building. It enters the first floor above the basement practically at ground level there being only one step up into the vestibule. This entrance will be used more often than the main entrance at the front as it is nearer the other medical buildings. The janitor's office is in the main corridor opposite this entrance and as all visitors must report to the janitor upon entering the building it means that the main entrance will not be used very much.

Construction Procedure

Tenders were submitted by several of the Montreal contractors for the construction of this building, that one being accepted which was submitted by E.

C. M. Cape & Company, and in June, 1921, they moved some of their equipment onto the site and commenced work. It had been generally predicted that the work would take a year to complete providing no change of plans was made or other unusual incident which could not be foreseen. It finally developed that these predictions had been very nearly correct.

Investigation previously carried out had shown that the whole site was entirely covered by a substratum of solid rock at a comparatively short height below ground level. The design of the foundations was naturally dependent on the nature of the material that would be encountered. The above information was already in the hands of the contractors for purposes of making up their tenders.

With a complete knowledge of soil conditions already available Cape & Co., started the work of excavation as soon as the necessary equipment could be brought to the job. In the meantime temporary offices and other small buildings were being erected near the site for the accommodation of the staff directing the work.

General view taken from the south side or front of the building, showing special form work in place: Top storey of main building still unfinished

(1). Excavation Work

There turned out to be about 5,000 cubic yards of earth excavation before the rock stratum was reached. This small quantity of excavation did not warrant the using of steam shovels or other mechanical equipment but was all done by hand labor. The site was easily approached from the road on the east side and also south side so that wagons were driven up close to where the men were working on the excavation. The conditions were ideal for carrying on such work as the approach for the teams was easy and the men only handled the excavated material once; digging from the face and throwing directly into the wagons. The routine of work followed was so good that it rarely happened that either teams or men were standing idle, as there always seemed to be a wagon or two standing to be filled. This part of the excavation was speedily finished.

In the meantime the contractors had moved the necessary equipment onto the site for the purpose of making the rock excavation. This consisted of several rock drills operated by steam which were started as soon as the rock stratum showed until the full battery was in action. The total amount of rock excavation only came to about 1,000 cubic yards which, coming from considerable area, did not require very deep drilling. The holes were drilled down to an elevation slightly below the sub-grade of the basement floor and in no case exceeded 7 ft. Explosive was used to blast out the rock.

The disposal of the excavated material, both earth and rock, was done by means of horses and wagons, the waste material being taken up University St., to the Mokon Stadium where it was needed to make an artificial fill. During the process of excavating the rock the teams were kept outside the area of the site and the loose rock was brought down to the south end by trucks, where a derrick picked up the detachable box and dumped it in the wagon.

(2). Foundations

The site having been prepared for the actual start to be made on the building the work on the foundations was at once commenced.

The nature of the sub-soil obviated the necessity of using reinforced concrete and mass concrete was used entirely in the foundations and the basement sub-floor. Footings were also placed on solid rock to carry the columns of the superstructure.

Tile drains were placed around the exterior of the foundation walls to carry off the ground water and the foundation walls were also given a double coating of waterproof pitch to guarantee them against dampness. This pitch was only applied to the walls below ground level.

By means of tongue and groove checks in the foundation walls, they were made as monolithic as possible with the basement sub-floor. Before placing the concrete for the basement floor it was necessary to smooth out the irregularities of the rock by means of a layer of broken stone over the whole area.

Simultaneously with the excavating work the demolition of a small one storey appendage to the south end of the old building was going on. This had been added to the old building after the temporary end had been placed following the fire and was used mainly as an entrance vestibule with locker rooms on both sides. It was built of brick with plaster on the inside and outside. The brick was salvaged and used for backing in the new building. There was a cellar underneath containing some old heating equipment which was also salvaged. This work was completed before the excavation was finished, leaving the end of the old building free of all obstructions when the time arrived to place the new foundations.

(3). Superstructure

The frame or skeleton, about which the superstructure is built, is entirely of reinforced concrete from foundation to roof, the reinforced concrete columns running down to footings built on the solid rock. In the intermediate section the lines of columns are on both walls and on both sides of the main corridor running through the building from north to south. At the points in the foundation walls, where the concrete columns rest the walls are enlarged or widened on the inside to afford a greater bearing surface for the columns. Between the north basement wall and the south wall of the old building the only excavation done was that necessary to carry the foundation walls and the columns down to solid rock.

In the front section of the building the columns are all wall bearing, the beams running in a north and south direction. This span is about 30 feet in the clear.

Heavy concrete beams span the distances from column to column except across the main corridor where a plain reinforced concrete slab was used and tied into the heavy beams which ran along on either side of the corridors.

The Brauson system of reinforced concrete floor was used throughout the building and it is designed as follows: Reinforced concrete joists or small beams 12" deep x 4" wide at the bottom are framed into and poured at the same time as the larger beams. These joists were spaced 20 inches apart centre to centre and they in their turn support the floor slab. It should also be noted that the slab is poured at the same time as the beams and joists. The slab can be made very thin under this system and contains very little reinforcing. In fact, the Brauson system has for its main object economy in the use of reinforcing steel and is specially useful at times when steel is expensive and hard to get. A hung ceiling applied to these Brauson Joists completely conceals them, only the beams showing below.

All plumbing is showing throughout except in the corridors where it is concealed in the walls behind doors. This enables them to reach any part of the whole plumbing system with minimum loss of time and labor.

A special type of demountable forms was used in conjunction with the Brauson Floor System. These are supplied by the Canadian Concrete Steel Co. Ltd., whose offices are on Union Ave.

This type of form consists essentially of an inverted truss made of wood and framed into the form work of the larger beams. This truss constitutes the only support for the joists forming part of the floor system no struts or wooden columns being used. A close examination of the accompanying photograph will give a general idea of the construction of the truss.

When the trusses are in place the remaining form work which includes the forms for the sides of the joists, and the slab between the joists, is put into position. The whole system is designed for the express purpose of avoiding the use of nails by substituting blocks and dowels and wedges in such a way as to bind the whole system together. They are easily demounted and may be used repeatedly where the distance between the beams is constant. Full information might be obtained by applying direct to the company. It would appear that considerable saving in time and material could be effected by the use of these forms in certain types of design and during a period of lumber scarcity.

The fresh concrete was delivered to the succeeding levels by means of an automatic tip bucket running in a tower which had been erected just outside the east wall. A Smith mixer, stationed quite close to the tower, dumped directly into the bucket which was hoisted to the desired level by a donkey engine. A large hopper was fastened to the side of the tower next to the building and received the load brought up by the bucket. This hopper delivered to the buggies which in their turn delivered the concrete in its final position. The man operating the hopper regulated the entire mixing and distribution. It was the rule to finish pouring one entire floor before moving the hopper to the floor above.

Outer Walls

Local Montreal limestone, cut and formed, was used for the exterior walls. This was supplied by the Villeray Cut Stone Co. in a condition marked and ready to place in position. The irregularities of the rear of the blocks were smoothed out by brick backing partly obtained from the demolition of the porch or vestibule which was formerly attached to the south end of the old building. These outer walls were further lined with terra-cotta tile supplied by a local company whose factory is just outside the city. The plaster was applied directly to this terra-cotta tile.

The interior walls or partitions are constructed of this same terra-cotta tile with the addition of plaster directly to this. All walls have been plastered, using a putty finish, and finally tinted in a light buff color. The walls of the corridors, stairs and lavatories received special attention, the two former being given a coating of Keenes Waterproof Cement over the area of the dado which is 4'-6" high. The dado in the lavatories is of marble to correspond to the other marble appointments in the lavatories. The walls of the corridors meet the floors in a cement core base to avoid the use of rectangular corners in places where dirt and dust is more liable to collect. The special treatment of the corridors and lavatories called for in the design was for sanitary reasons.

The floors are not of the same material throughout the building, different materials being used depending upon the purpose of the various rooms. The corridor floors are terrazzo, laid directly on the 7" reinforced concrete slab which was used here instead of the Brauson System as found in the rest of the building. The floors in all the lavatories in the building are also of terrazzo. This type of floor is particularly durable and very sanitary. It is in places of this nature that durability and cleanliness are most required and the terrazzo floor answers both purposes.

In the class-rooms and administrative offices selected birch flooring was laid on an asbestos fill 2 inches thick. This asbestos fill, laid directly on the concrete, has the primary advantage of being fireproof and will also resist the penetrating action of the nails in the same manner as wood. The nails hold firmly in this asbestos fill thus maintaining the birch floor in its original position.

The chemical laboratories have mastic asphalt floors which were found to be the least susceptible to the action of chemicals and also replaceable at the minimum cost. Elaborate experiments were carried out on all commercial forms of flooring so as to determine which would be most suitable under the circumstances obtaining in a chemistry laboratory.

The chemistry laboratories are also equipped with a special device, called a fume cabinet, with a direct connection through to the roof by means of a tile pipe. An electric blower has been installed to act in conjunction with this fume cabinet to create an upward current of air to draw off the powerful fumes resulting from certain experiments.

Apárt from the floors only 2 kinds of wood were used in the building, oak and chestnut. The trim wherever it occurs, and it is not often, is of oak. The doors opening onto the corridors are of oak veneer on a birch base and are of the flat hospital type with 2 panels; the upper panel being glazed with translucent glass. All connecting doors are of the unglazed hospital type with a single flush panel and these are also oak veneer on a birch base.

The cupboards in the laboratories are of chestnut. The table tops have been chemically treated to make them as impervious as possible to the action of chemicals and fumes. What this chemical treatment consisted of was based on a long series of experiments using different woods and applying different treatments.

The paint in the laboratories has also been specially prepared and mixed to withstand the action of the strong fumes in the rooms.

Ventilation

An efficient and modern system of ventilating all the rooms in the building has been installed in the basement on the west side of the building. A powerful suction fan run by an electric motor draws fresh air in through a large square opening protected by a heavy screen. This screen is to prevent the admittance of leaves or twigs that might tend to injure the mechanism. After passing the screen the air is drawn through a double bank of steam coils where it is warmed and then passes on to the air washer. This air washer presents a solid unbroken curtain of fine spray through which the air must pass. It then passes through a series of plates where the water is mostly extracted from the air before it goes to the supply tube leading to the various rooms.

Heating

A tunnel 7 feet high and 6 feet wide connects the new building with the power and heating plant a short distance to the west. The pipes for supplying heat to the new building as well as the cables for the electric lighting are all contained in this tunnel. Steam heat is supplied through these mains to 3 water heaters, 2 of which are to heat the building and the third to supply hot water in the sinks, basins, lavatories, etc.

Summary

It was the pre-arranged idea of the architects to have the structure, both inside and outside, follow very simple and severe architectural lines. No. ornamentation was considered but the reverse idea was carried out. Plainness of design inside will result in a sanitary condition all the more essential to people who are working in an artificial atmosphere sometimes saturated with injurious fumes. They have tried as far as possible to relieve these conditions, and it is hoped that they have succeeded in greater degree.

Ross and MacDonald are the architects for this building as they have been for so many of Montreal's larger buildings.

The cost of the completed building was very nearly $500,000.00. There is 1,000,000 cu. ft. of space in the building.

Messrs. Beaubien and Busfield Form Partnership

A partnership under the name of Beaubien, Busfield and Company has been formed by two well-known consulting engineers of Montreal for the purpose of conducting a general consulting practice. The senior member of the firm, Mr. de Gaspe Beaubien, has been in private practice in Montreal as an electrical and mechanical consulting engineer for the past fifteen years. He is a graduate of McGill University, a member of the Engineering Institute of Canada and a member of the American Institute of Electrical Engineers. For several years he has been a member of the Electrical Service Commission of the city of Montreal and has been connected with many important engineering undertakings during the course of his career.

Mr. J. L. Busfield, the junior member of the firm, is a graduate of London University of civil and mechanical engineering, and has been a resident of Montreal since 1907. During this period he has been connected with the engineering department of the Grand Trunk Railway, with the construction of the Mount Royal Tunnel for Mackenzie, Mann & Company and for a number of years held a responsible position with the firm of Walter J. Francis and Company, consulting engineers. From 1919 until recently, Mr. Busfield held the honorary position of Secretary-treasurer of the Montreal Branch of the Engineering Institute of Canada, and owing to his activities in this connection has become well-known to the engineering fraternity of Montreal.

Both Mr. Beaubien and Mr. Busfield are members of the Corporation of Professional Engineers of the province of Quebec.

Apprenticeship Thoroughly Discussed at Builders' Conference

The Provincial Builders' and Supply Association Endorse the Scheme of Mr. Pigott for Increasing the Supply of Mechanics—Also Pass Resolutions Relating to Seasonal Unemployment and Accident Prevention

A discussion of several important matters affecting the construction industry and the passing of strong resolutions in connection with them, were outstanding features of the eleventh annual meeting of the Provincial Builders' & Supply Association of Ontario. This organization met on this occasion in London, Ont., as the guests of the local Builders' Exchange, and it is generally felt by the executive that the three-day convention—from January 23rd to 25th—was as successful as any other in the history of the organization although the attendance was not quite as great as was expected. Some of the noteworthy developments were the approval of the apprenticeship scheme drawn up by Mr. J. M. Pigott and outlined in the Contract Record of January 20th; the endorsement of an Accident Preventive Association; the urging of some measures for the relief of unemployment in the building trades during the winter months, and an appeal for more co-operation between non-resident and local contractors in regard to wage scales.

The convention opened in the afternoon of January 23rd with routine business matters including the reading and passing of the minutes of the last annual meeting; the reading of reports of executive meetings and the appointment of committees by the chairman, Mr. Norris T. Gibb. Following these, the individual exchanges presented reports of their past year's activities. The report of the London Exchange was presented by Mr. George S. Gould, the secretary, and while admitting that things had been quiet during the past year, he referred to the appointment of a strong committee to prepare for forthcoming meetings a programme of topics of essential importance to the success of the contracting business, and to procure capable speakers fully conversant with these subjects in order that the meetings of the exchange will prove of interest and helpfulness. Mr. Gould had something to say regarding co-operation, and his remarks in this connection were:

"Associations will soon be of small importance if they are not continually reaching out after greater benefits for the building industry. We all lack the aggressiveness of united labor. They are ever moving up to the place of power while we are slowly yielding our prerogatives to them. Of course, their forward march is only made possible by their playing the political game skilfully, but the point is this that it would be impossible for men to accomplish what they have without a powerfully organized united party, completely controlled by ambitious leaders whose sole aim is power."

Reports were also given of the work of the exchanges at Sarnia, Kitchener, Sault Ste. Marie, Peterboro, Chatham, Hamilton, Galt and Toronto.

Mr. Gibbs' presidential address, while brief, was an adequate review of the activities of the Association during the past year. He outlined the work that the organization had done in improving the status of the building industry and showed how closely they were in touch with the government and any legislation which it proposed to carry out affecting the construction business. He referred in particular to the necessity for a minimum workmen's compensation fee, a subject which Mr. George Gander, the secretary, also emphasized in a few remarks after Mr. Gibbs' address.

Mr. Gander then presented the report of the Legislative Committee. It is reprinted herewith and indicates to what extent the committee have followed up the resolutions that were adopted at the last annual meeting of the Association.

Legislative Matters

At the last meeting in Peterboro resolutions were made regarding matters that were to be carried through by your Legislative Committee, and as far as possible we have tried to bring them to a successful issue. The first question or resolution was your objection to labor being represented on the Compensation Board. It was also urged that if this representative was to be continued, the employers should likewise have the same privilege. The objection and petition were placed before Premier Drury by a committee of employers, including your own representative. While the Premier informed us that Mr. Halford was hardly the nominee of the labor party, he could not place him as representing any other body. We then proposed a five-man board with our nominee to be accepted as the choice of the employers, but he told us we would have to lobby the members of the house so as to form the five-man board, as he was not sure that he could get that proposition through as a government bill. We then asked him, in the event of the Board being enlarged to five, if he would accept our nominee. On this point he rather edged, because another name had been presented to him, which he was rather forced to consider. As we could not get his word to support and accept our nominee, we dropped the whole idea of a five-man board.

Your resolution asking the Compensation Board to allow another vote to be taken on the formation of an Accident Prevention Association was granted. The Board printed and issued the ballots which covered the necessary questions they desired. They also scrutinized our circular so that it should not contain any item that would be misleading to the voter. The result was a pleasant reverse to that of our last vote, it standing 608 yes, 295 no, 19 spoiled. It now lies with the Board to grant its sanction and the necessary financing of this work. We are the only class of employers who have not taken accident prevention work, and to all appearances we are suffering through that neglect.

During the closing moments of the Legislative session our attention was called to a bill which had received its third reading but was referred to a special committee for finality. This bill was fathered by manufacturers and others of Windsor and adjacent localities and was sponsored by Dr. Tolmie. It called for employers to pay all costs for accidents, deaths and expenses which meant the carrying of liability insurance as well as our own compensation. This was opposed strongly by your committee and the request that the construction industry should be left out of this penalty did not appeal to us, as we deemed there was no necessity for any drastic change. The chairman then put the vote to the committee and declared the amendment lost.

We are pleased to say that our objection to the proposed Lien Act was well thought of and the government as a final touch stated that its wish would be for a uniform act that would cover all the provinces. This was placed before the Dominion Bar Association meeting in Vancouver in August. After the proposal had been made some western provinces objected to the bill, and the bill as proposed by the York County Lien Association will be presented by the Hon. Mr. Raney to the house this session which will in all likelihood be adopted.

Nothing more has been done with the 8 hr. day bill, yet labor is still presenting reasons before the cabinet as to the policy of adopting the same. They are also clamouring for a fair wage clause on the same condition as the Dominion government. Both eight hour day, and fair wage clauses will have to be watched in the interests of the association and the building industry.

The sales tax is a sore topic with many contractors. Not having any refund for the first sales tax was bad enough, but when the excise sales tax was added it meant that many contractors were again caught with unfinished contracts, which meant their clients often escaped, because contracts called for inclusion of sales tax, and while arrangements had been made to meet the first sales tax very few were prepared to meet the increased tax. It is unfortunate that our Toronto Board of Education is the worst offender by refusing to pay the original tax and we find other school boards throughout the Province adopting the same tactics. The owner is in honor bound to pay this tax, yet the government fails to support the contractors in this contention. The C.M.A. deserve our thanks for their effort to solve and make plain the many intricacies of various tax collections.

Your representative on the Ontario Employment Service Council will report that the unemployment problem is a hard one to solve. Yet the government is leaning toward a system of publicity that will try and induce municipalities, school boards, and governing bodies to bring their construction work along in such a manner as to relieve seasonal unemployment. They now realize the error of bringing forward too much work when contractors are already loaded up, work that could be well managed to be brought forward at a more reasonable time.

Apprenticeship Scheme of Mr. Pigott

The rest of this session was then devoted to a discussion of several matters affecting the members. On the matter of workmen's compensation, several members voiced their opinions, especially regarding whether employees should pay a part of the assessment. There was also considerable discussion on the question of raising wage scales by non-resident contractors who come into a locality to take a job. After a thorough discussion of these and other topics, it was left to the Resolutions Committee to draft recommendations concerning them.

One of the most important items on the programme of Wednesday the 24th was the presentation of a paper by Mr. J. M. Pigott on "Apprenticeship." This paper has already appeared in the Contract Record of December 20th, and there is no further need of referring in this article to the details of the scheme suggested by him. The discussion which followed Mr. Pigott's address indicated that the members of the Association were very vitally interested in the matter of apprenticeship and anxious that some practical and definite scheme for increasing the number of skilled mechanics should be initiated. The conclusion arrived at was that Mr. Pigott's scheme was the most desirable that had been suggested and it was decided to endorse his plan and recommend its acceptance. The actual resolutions in connection with this and other matters are printed below.

The resolutions committee, after careful deliberation and consideration of important matters affecting the construction industry, brought in the following recommendations in the form of resolutions, all of which were adopted by the association:

1. Whereas it is generally recognized that unemployment in the building trades is seriously increased in the winter season and whereas the Employment Service Council of Ontario, after investigation, has found that it is possible to keep the cost of building down by year-round employment of labor,

Therefore, be it resolved that the Employment Service Council be asked to institute a publicity campaign with a view to inducing government, municipal, educational and other public bodies to carry out as much work as possible during the winter months so that unemployment will be alleviated and work will be spread out more uniformly over the year instead of being bulked during a comparatively few months.

2. Whereas the present method of assessment for Workmen's Compensation does not put sufficient burden on those with small payrolls in proportion to the work involved in administering the Compensation Act on their behalf,

Therefore, be it resolved that this association recommend that the Workmen's Compensation Act be amended to provide for a minimum fee of five dollars.

Increasing the Number of Skilled Mechanics

3. Whereas there appears to be an urgent need for some scheme that will increase the number of skilled mechanics in the building trades.

Therefore, be it resolved that this association endorse fully the scheme of apprentice training drawn up by Mr. J. M. Pigott.

4. Whereas the supply of skilled building mechanics is inadequate to meet the requirements of the industry and whereas present methods have failed to induce sufficient apprentices to take up the building trades.

Therefore, be it resolved that the Provincial and Dominion Governments be asked to sanction a scheme whereby they will aid, financially and otherwise, the training of apprentices in the building trades, both through employment with contractors and also through proper training in vocational schools, in accord with the plan suggested by Mr. Pigott, which plan has been fully endorsed by this association.

5. Whereas, the time for operation of the Accident Prevention Association under the present charter has elapsed.

Be it resolved that this charter be surrendered.

6. Whereas the builders and contractors of Ontario, have, through a ballot taken by the Workmen's Compensation Board, signified their approval of the formation of an Accident Preventive Association.

Therefore, be it resolved that the organization and operation of such an association be now actively proceeded with. It was also recommended that five provisional directors for the association be selected at the meeting.

7. Whereas some instances have been noted of undue inflation of wages by outside contractors.

Therefore, be it resolved that non-resident contractors be requested to always consult the local contractors or their association so that not higher than the prevailing wage scale will be adopted as applying to local men employed by such non-resident contractor, this not to apply to men brought in by the contractor and who are not regular residents of the locality affected.

Be it resolved that this resolution be presented for approval at the Conference of the A.C.B.C.I. in Quebec.

8. Be it resolved that city architects, building inspectors or other officials issuing building permits be urged to have endorsed on such permit words to the effect that unless the owner assures himself that the contractor is covered by Workmen's Compensation, he will be responsible for any liability arising out of accidents.

The executive was given instructions to consider a memorandum that the Trades and Labor Council had presented to the Dominion Government and in which certain changes in legislation were requested, especially affecting immigration, employment of foreign labor and other questions in which employers of building labor were interested. The executive was also given power to determine the place of convention for the next meeting and to decide if a two-day convention would be preferable to the present three-day meeting.

New Officers

The report of the nominating committee was accepted and the officers for 1923 are as follows:—

President, Peter McLarty, Sault Ste. Marie; First vice-president, Casper Braun, Kitchener; second vice-president, J. K. Sheehy, Peterboro; third vice-president, J. S. Wilson, Galt; directors,— Norris Gibb, Sarnia; J. M. Pigott, Hamilton; W. E. Dillon, Toronto; T. R. Wright, London; A. W. Carmichael, Toronto; F. Ingram, Stratford; S. Jones, London; J. G. Blakely, Chatham; and W. V. Dunker, Kitchener.

Good Prospects in London

By GEO. S. GOULD
Secretary Builders' Exchange of London

The London building inspector's report shows that there was expended on construction during the year the sum of $2,605,630, an increase over the previous year of about $85,000. This amount is, of course, far short of what it should be, for if we glance through the classification of the different works we find that small house work alone embraced $1,700,000, leaving barely one million for all public works, factories, warehouses, etc.

This condition convinces us that larger construction work cannot be much longer delayed. We have on the tables now a city hall, registry office, a collegiate in the South and a number of additions to churches and schools.

Our conditions with our employees are at present amicable and we do not anticipate any trouble in the wage question this season, but do expect a serious shortage of skilled help in some trades. This we believe is the great unsolved problem that needs the wisest counsels possible to unravel.

Hamilton Predicts Prosperity

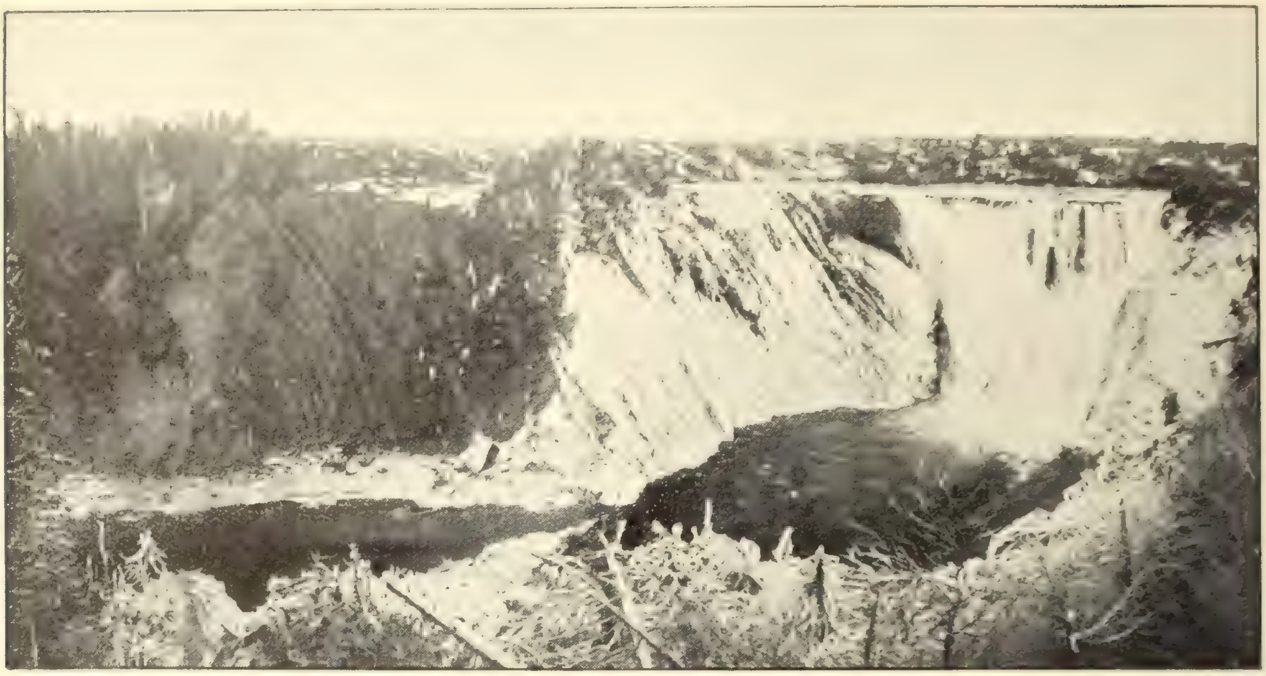
By J. F. MERCER
Retiring President, Hamilton Branch, A.C.B.C.I.

Business is "growing better and better every day." This is our slogan for 1923, and we firmly believe that the year ahead of us will be the best year in the industry for some time. A thorough study of the business conditions and of every source of information has been made by our exchange during the past three months and we find that, camparatively speaking, 1922 has not been a business year with which we could find any particular fault, even though some of us, perhaps, could have handled more work, and the assurance and encouragement we find on every hand has prompted us to prepare for a lively year,—one that, we believe, will demand our best efforts and a spirit to go out prepared for plenty of big work.

We believe 1923 will go down in history as an industrial year particularly. All will agree that for the past four years nearly every industrial corporation has had its purse strings held tight. Why was this? For the good reason that building costs were high, in fact, too high for anyone who could possibly wait for lower costs. Now the result has been to lay over for a future date every contract, large and small (repair work included) awaiting lower costs. Today labor and material costs are at the bottom and we cannot conceive of them getting lower. The public now realizes this fact and, we believe, are going to proceed with the held-up work. They feel, and rightly so, that costs will not be lower; in fact, they observe many materials getting stronger again, and this is having the effect of chasing them, as it were, to their architects for plans on many badly needed additions and improvements long held on the waiting list.

Our local architects tell us there is much work to be announced during the next two months, a large portion of it being laid-over plans. We also are advised of considerable money to be spent on public and semi-public buildings, including hospital extensions and several churches in newly developed districts of our city. The detailed building permits for Hamilton during 1922 totaled $4,928,465, which shows a decided improvement over 1921. The figures are not yet completed covering the present month, but we know that to date they exceed the total for the month of January, 1922, which prompts us to again repeat, business is "growing better and better day by day."

The City of North Vancouver and the surrounding municipalities voted on January 20 by a very large majority to approve of the proposals to construct a railway and vehicular bridge from Vancouver city across the harbour to North Vancouver. The total length of the bridge and approaches will be about one mile. The work is to be financed by the Burrard Inlet Tunnel & Bridging Co. on the security of the bonds of the cities and municipalities interested and the construction is to be carried out jointly by the Northern Construction Co. Ltd. and J. Stewart, contractors, Vancouver. The consulting engineer for the work is A. D. Swan of Montreal.



General view of the Grand Metis Falls. Power house site is on the beach just to the left of the middle of the picture. Dam is about 100 ft. above falls and canal and forebay are carried down east bank to immediately above power house

Hydro-Electric Power Development on the Metis River, P. Q.

The Lower St. Lawrence Power Co. Are Making Use of the Grand Metis Falls for Plant of 3500 h.p. Initial Capacity—7000 h. p. Will be the Ultimate Development—Special Features of the Project

By the Contract Record's Montreal Correspondent

Following full investigations during 1921 and the early part of 1922 a company was formed called The Lower St. Lawrence Power Co. Limited, with the object of developing the water power on the Metis River, province of Quebec, at Grand Metis Falls and consolidating the various local power companies to form a general distribution system. The designs for the main power development were made in the summer of 1922 and construction was started in the early autumn. A number of the local power companies have been purchased and the company is operating these at the present time.

The market which it is intended to supply with power and light, comprises the district from Bic to Matane along the south shore of the St. Lawrence River and along the Matapedia Valley from Sayabec to Lac aux Saumons. This district includes something over 30 municipalities with a total population of more than 30,000 as well as a larger farming population spread over the area. The heavy dotted lines on the map herewith show the approximate locations of the transmission lines that would be necessary to serve the territory mentioned above.

As this power development is the only large one possible in the district it should be an important factor in the general development of the surrounding country when the power is made available. A first class electric power plant having an ultimate capacity of about 7,000 h.p., at the main falls and an additional 2,000 h.p. at another site just below the main falls will provide sufficient power to attract many of the smaller industries to the district. In addition the people in the district will have the advantages pertaining to a reliable power and light service not only in the towns but on the farms as well.

Initial Unit is 3,500 H.P.

To supply the present demand it has been arranged to instal an initial unit at the Grande Metis Falls site to develop about 3,500 h.p. and in the future when the demand increases to add at least one more circular unit to bring the total output to about 7,000 h.p. The site at the lower falls can also be utilized for the same purpose, the ultimate capacity being about one-third that at the Grande Metis Falls. The future maximum capacity depends altogether on the amount of construction which can be economically done on the storage lakes at the headwaters of the river. This would be done by the Quebec Streams Commission.

Following a thorough canvass and investigation of the power and light market of the district it would appear almost certain that the venture will be a success from the beginning and that stockholders in the new company will realize a fair return.

Grand Falls Development

The following information was obtained by our Montreal Correspondent from the following sources: Walter J. Francis and Company, consulting engineers for the Lower St. Lawrence Power Co. Ltd.; Mr. J. H. MacLaren of the Foundation Co. Ltd., the contractors for the dam and power house; and the Quebec Streams Commission, which will undertake the development of the storage reservoirs.

Investigations

The location of the Metis River is on the south shore of the River St. Lawrence some distance (300 miles) below Quebec City. It is mostly in Rimouski County near the boundary between Rimouski and Matane counties. Its various branches vary in length between 30 and 40 miles long and all join the main stream above the Grande Metis Falls which is the site of the development.

The watershed which is drained by the Metis River is 735 square miles in area, (Quebec Streams Commission's figures). This territory is almost entirely hilly and is mostly wooded, with a certain percentage of open farm land of good quality. It also contains several lakes which can be used eventually as storage reservoirs, to regulate the flow of the river and supply more water for power purposes.

The Stream Commission's Duties

The Quebec Streams Commission has accurate information regarding the area of these lakes and their ultimate possibilities as storage. The provincial government has control of the water rights on various streams throughout the province and it follows the policy of developing storage dams at the request of power site owners when it is found that the expense is justified. In other parts of the province several such dams have been built and are proving eminently satisfactory in augmenting and regulating the flow of water. A notable example of this is the present Gouin Dam which regulates the flow of the St. Maurice River running through Shawinigan Falls and into the St Lawrence at Three Rivers. This dam has more than doubled the former low flow of the river. In the case of the Metis River it will be probably necessary to develop the first of the three proposed reservoirs in the immediate future, as the power demands of the district are showing evidence of rapid growth. By the time the system is ready for use this year the load will likely be sufficient to require a regulated flow in the river.

The available storage sites are situated at several lakes within the watershed. These vary in size and capacity, the smallest giving a storage capacity of about 18 square-mile-feet and varying in size from this up to about 100 square-mile-feet, amounting in all to approximately 200 square-mile-feet. This estimated storage capacity has been worked out in a preliminarp way by the Quebec Streams Commission, and is subject to final revisions. Detailed surveys and estimates have been prepared for the first proposed reservoirs. In any case it appears to be a conservative estimate, and final revisions would probably give larger figures on the capacity. This estimated amount of storage is given exclusive of log driving requirements and should be always available.

During the 1921 session of the provincial legislature a bill was introduced and passed authorizing the Quebec Streams Commission to take control of the river and spend up to $225,000 on the construction of storage dams when called upon to do so by the power company. The company would be obliged to pay the annual operating costs and fixed charges on this work for a period of years, at rates to be agreed upon.

Precipitation

The average yearly precipitation in the watershed is about 33 inches including both snow and rain, and the average run off is estimated at about 50% of this The ordinary low water flow is stated to be about 200 cu. ft. per sec. The average flow taken over a whole year is between 700 and 800 c.f.s. The flow during the ordinary spring flood is in the neighborhood of 7,000 c.f.s. while the amount of water passing during an occasional maximum spring flood is greater than this. Investigation by the Foundation Co. Ltd., at an old dam some distance down the river has led them to conclude that the maximum flood flow is in the neighborhood of 15,000 c.f.s. The commercial regulated flow possible from progressive development of reservoirs, exclusive of water needed for log driving is estimated to be about 500 c.f.s. To obtain this average flow would necessitate construction of 3 or 4 dams to use all available storage, but a smaller flow may be had by a partial development of storage capacity. This is the part of the work allotted to the Quebec Streams Commission and will be carried out when the power company is ready to utilize the extra flow.

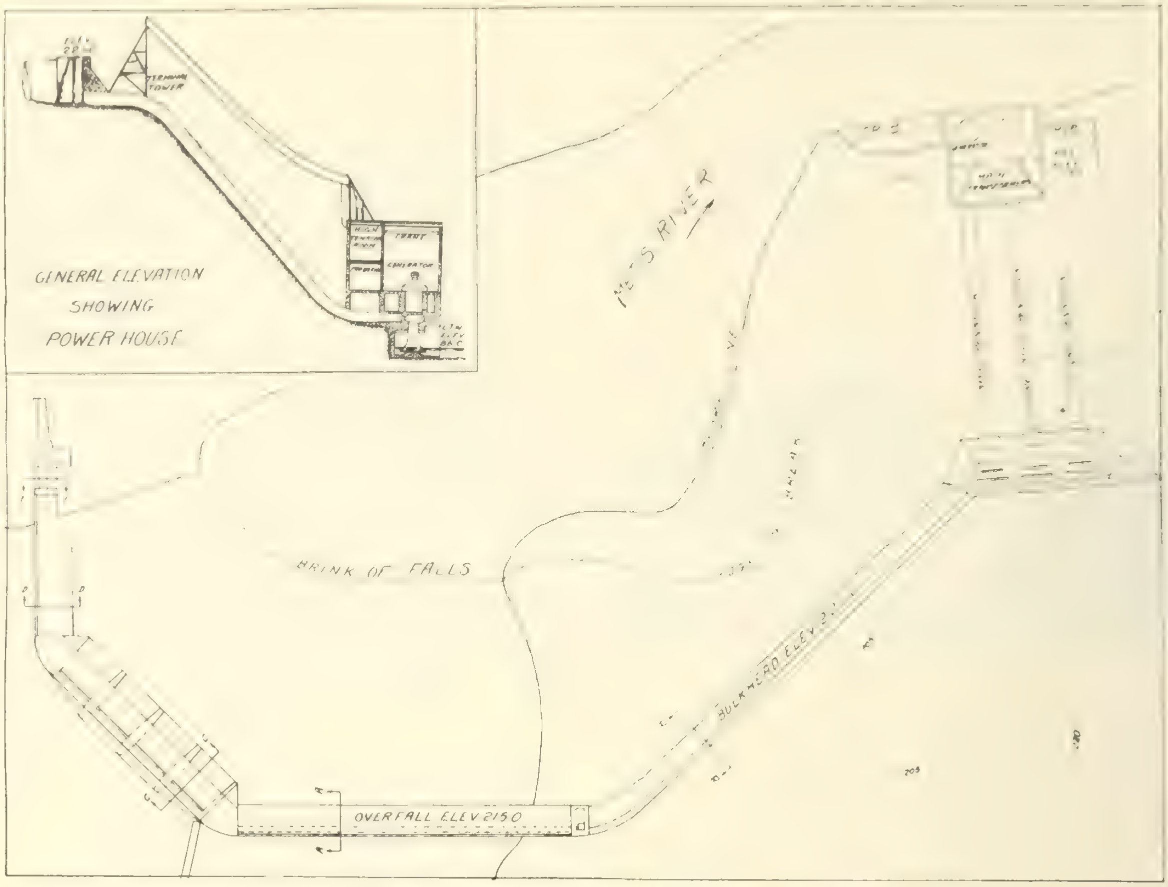
Description of Site

The head available at Grande Metis is about 125 ft. with very little fluctuation, and is obtained by an almost vertical fall, the total length of the penstocks being about 185 feet. At the lower power site, situated about a half mile downstream from the main falls, there is a possible head of 40 feet, and this may eventually be used in conjunction with the present system. At present the downstream site is occupied by a small grist mill.

The topography of the banks can best be appreciated by examination of the accompanying cut. The left or west bank slopes rather steeply away from water's edge until the brink of the falls is reached, when the bank becomes extremely steep. On the opposite side the conditions below the edge of the falls are the same but the bank above the falls is flatter than on the west side, being almost level for some distance out from the water's edge before rising sharply. This plateau-like topography of the east bank continues for some distance (300 feet) downstream below the falls before merging into the cliff, and serves a very useful purpose in the development. It would appear as though nature had purposely done part of the necessary work before man arrived on the spot. There is a small knob of steep bank which is plainly shown in the cut. For some considerable distance upstream from the falls the banks remain almost uniform in character even beyond the point of future water level above the dam. The banks below the falls are steep with a narrow strip of beach between the toe of the slope and the water's edge.

Engineering Procedure

As well as studying the topography in the environs of the proposed site of the dam it was necessary to take comprehensive soundings in the river above the falls to determine the topography of the river bed. At the same time the engineer also determined the nature of the rock forming the river bed. The information thus obtained showed them that the river bed was comparatively level almost from bank to bank, containing few irregularities and these were very small. The elevation of the river bottom at the site of dam is about El.200.00 (above mean Atlantic sea level C.G.S. datum). This data refers to a point about 100 feet upstream from the falls, and here was found a very suitable stratum of rock upon which to build the dam. It was a simple matter to then determine the nature of the soil forming the banks by sinking test pits in various localities. In all cases rock was



Plan and sectional elevation of the Grand Metis plant

found to be comparatively close to the ground surface. This information was all required and obtained before the actual design of the structure could be started.

Design

In considering the natural topography of the site the designers could not overlook the fact that a natural forebay had been provided for them on the east side of the river, whereby the water could be led to the intake. This fact was one of the main factors in determining the type of layout to be constructed. Another factor which also influenced the design was a provision that had to be made to guarantee the proper passage over the spillways and through the sluices of the large amount of water following the spring break-up.

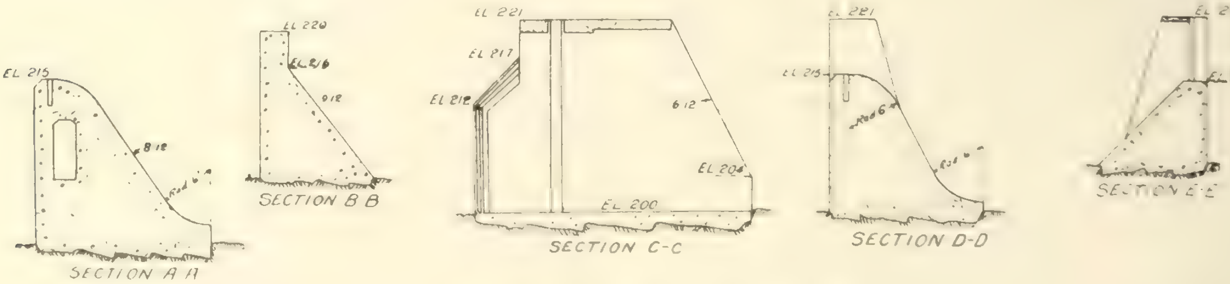
It will be seen that the following factors determined the ultimate design:

(a) Amount of water necessary for the development of power.

(b) The natural topography of the site.

(c) The amount of water which had to be handled during spring floods.

With these three governing factors in mind the following design was adopted. The centre section of the dam consists of 4 main waste water sluices of 20 feet width each continued down to the river bed at El. 200.00. Two overfall or spillway sections are provided, one on each side of the centre section with the crest in each case at El. 215.00. A 10 foot opening on the west side at the end of the spillway section is provided for the passage of logs; and a short length of plain gravity section on the same side to seal the dam at the shore end. Continuous with the spillway on the east side there is a longer stretch of gravity wall running down to the intake and forming one boundary of the forebay. The east bank of the river forms the other boundary of the forebay. An intake structure containing 2 intakes and designed in such a way as to allow for the addition of a third intake with a minimum of cost has been included. Two circular section steel penstocks lead from the intake to the power house situated at the foot of the hill.



Sections of the dam, spillway and log chute

The present power house has been designed to accommodate two 3,500 h.p. generating units. There was also another minor phase of the situation which had to be considered namely, the effect that the rising of the water would have on bordering properties above the dam. This phase becomes of major importance during the time of spring floods, although the land that would be flooded is either farm land or waste land, no important buildings or industries being affected.

Provision for Contingencies

The length of spillway and number of sluices was determined by what was thought would be the future maximum amount of water passing during high water periods. In an effort to fix upon some definite figure for this volume a study was made of conditions at the old dam and grist mill further down the stream. This investigation showed that the previous maximum flow had been about 15,000 c.f.s. and to provide for contigencies this figure was increased by 50% and the dam designed to safely pass the larger amount of water. Thus, in round figures about 25,000 c.f.s. of water will be safely accommodated. There were apparently two reasons for making the spillways so long. In the first place, it might happen that an unusual amount of snow would be followed by a rapid break-up in the spring causing abnormal flood conditions. Secondly, the average spring flood amounting to about 7,000 to 8,000 c.f.s. can be handled over the spillways without any adjustment of the stop logs or the installation of expensive sluice gates. The process of adjusting stop logs in the sluices is slow and tedious, requiring the work of several men to do properly, and the fixed charges on stony or similar sluice gates are high. This item of expense should, therefore, be reduced almost to nothing in this particular case. There is also a saving in cost due to a minimum of wear and tear on the stop logs and the operating machinery. The small increase in cost of the spillway section over embankment section, when the results obtainable are considered, warranted the putting in of slightly more of the former type than was necessary.

Looking downstream on the Metis river towards the crest of falls. Note rapids and ledges of rock in shallow river above falls

Special Feature

It should be noted here that a change in general design of stop log checks has been introduced. Generally speaking, the checks for stop logs have been designed with two channels anchored in the concrete which serve as guides for the logs to slide on, the anchor bolts being counter sunk flush with channel so as to eliminate obstruction.

In this particular case an I beam was used on the upstream side of the check instead of the usual channel and the extra flange thus provided serves to guide the lifting stems. A steel pad is attached to the bottom of each of the two lifting stems (I beams) which are raised and lowered by the winch to adjust the logs. The clearance between the edges of this pad and the sides of the check is very small, (about ¼" on each side). This clearance will permit of the free movement of the hoisting apparatus and at the same time prevent excessive lateral motion of the foot of the hoisting stems. The addition of this device should greatly simplify the process of adjusting the stop logs.

There will be a complete description, in a future number of the "Contract Record," of the methods adopted in the construction of the dam, penstocks and power house.—Ed.]

Wages and Prices During Past Year

Wage scales have declined slightly. The Federal Department of Labor, in reporting the index number of wages paid to six main groups of building trades in thirteen cities, quotes 162.5 for 1922, as against 170.5 a year ago. Low wages are popularly associated with unemployment. But in 1922 declining wages have been accompanied by a steady decrease in unemployment, and at the same time strikes have been less numerous and have resulted in far less loss of working time than in 1921.

To bring the year's movement in material prices into perspective it is necessary to recall that the highest point ever attained by wholesales quotations in this country was reached in May, 1920, when the index number of 48 lines of material stood 184 per cent. above the average level of the year 1913. Deflation proceeded rapidly during 1921, and at the beginning of the year under review the index had fallen to 93 per cent. above the 1913 standard. For several months on into the spring of 1922, the decline continued, though at a slackening pace. After striking bottom at 78 per cent., the trend turned slightly but definitely upward, in keeping with the movement of commodity prices generally. For nine months now, fluctuations have been of minor character, never raising the index number to more than 85 per cent. above 1913, or to less than 83 per cent. At the present moment the index rests at 183.5 or 83.5 above the 1913 base.

Progress in Hydraulic Engineering

Progress in Hydraulic Engineering, 1922.—Dominion Engineering Works, Limited, Montreal. This publication is a book of about 70 pages, 9 x 12, well illustrated by cuts and charts. It contains the principal papers presented at the 1922 Hydro-electric Conference held under the auspices of the Engineers' Club of Philadelphia and the American Society of Mechanical Engineers and allied bodies. The hydraulic and electrical features of the Queenston-Chippewa power development are described in some detail. The rapid development of the hydraulic turbine within the past few years has brought forward many new problems, and how some of these have been solved is outlined in a paper by H. Birchard Taylor and Lewis F. Moody, "The Hydraulic Turbine in Evolution." The book will be sent on request to hydraulic engineers or water power owners.

Clay Products Manufacturers Hold an Interesting Meeting in Hamilton

A Joint Convention of the Canadian National Clay Products Association and the Western Ontario Clay Workers' Association—Lively Discussion on Topics of Interest to the Trade—Good Program of Papers

A joint convention of the Canadian National Clay Products Association and the Western Ontario Clay Workers' Association was held on January 23, 24 and 25, at the Royal Connaught Hotel, Hamilton, and an excellent program of papers and addresses on subjects of real interest to the industry was presented. There was a large representation of members present and lively discussion featured all the sessions.

Mr. Ryland H. New, president of the C.N.C.P.A., was in the chair at the first session on Tuesday morning, which was taken up largely with association business, the presentation of reports, etc., but also included two papers, the first by Mr. Wm. Burgess, on "Kiln Bracing," and the other on "Results Obtained with Pyrometers" by R. F. Townsley.

Ald. Bert Burrell represented the city in extending a civic welcome to the delegates at their first luncheon on Tuesday. He assured the members that Hamilton felt cmoplimented at being chosen as their convention headquarters this year and stated that the city's growth is closely associated with the progress of the clay industry of that district. The speaker at the luncheon was Mr. J. M. Pigott, of the Pigott-Healy Construction Company, of Hamilton, whose subject was "Success of Co-operation." In this connection, he said in part: "The building program for this year is going to be controlled by the number of men available to carry it out. That makes the apprenticeship question of interest to you. Then, by having certain types of construction started during spring and fall instead of during the peak load of building a better distribution of employment will result. This will have its effect on wages and the earnings of employees and so affects you.

"While the Association of Canadian Building & Construction Industries has not stamped out all disreputable methods of doing business, we have driven them under cover. We have boosted the Canadian idea and used our influence against the use of American material in public buildings.

"The association," he continued, "intends to put a proposition before the provincial and federal governments regarding the shortage of building mechanics, due to lack of apprentices. We propose that boys be taken on at $50 a month all the year round until they finish their apprenticeship, which includes a winter course in the technical school. The industry as a whole would pay the boy's apprenticeship allowance. During the building months they would be farmed out to the various contractors. We want a direct contribution from the Ontario and Canadian Governments. There are not now enough apprentices in the trade to take care of the death rate, let alone those who drift into other trades."

Accounting for Clay Plants

The afternoon session on Tuesday started off with the reading of a paper on "Simplified Clay Plant Accounting" by Fred Page-Higgins, which dealt with a suggested system of accounting for a business of this nature and made clear the purposes it served in enabling the head of the business to conserve the capital invested. He impressed his hearers with the benefits that could be derived from a correct system of accounting. "Manufacturers have many mutual interests," he stated, "and if a uniform costing and accounting system could be adopted by the industry, a comparison of the costs would be possible, through your association, if deemed advisable, and provision could be made for keeping the identity of each plant secret. Such cmparison would be a valuable aid in locating the leaks."

Mr. W. L. McClennan, of the Penn-Canadian Coal Company, read a paper on "Economical Burning of Coal" which included several extracts from two recent reports of the United States Coal Commission.

Mr. A. G. Dalzell's paper on "How Building By-Laws May Reduce Our National Fire Loss," also read at this session, will be presented in our next issue.

Mr. A. A. Paoli, representing the Canadian Ingersoll-Rand Company, spoke on "Drilling Shale" and the closing feature of this interesting session was the showing of a film picturing the manufacture of soft-mud-brickmaking machinery, by the Hadfield-Penfield Steel Company, of Bucyrus, Ohio. Two representatives of the company were present and explained the processes pictured in the film.

Business was suspended on Tuesday evening and the members and lady friends attended a theatre party at the Pantages Theatre.

Tile Farm Drainage

Wednesday morning's session was given over to W.O.C.W. business, the meeting opening with a paper on the "Necessity of Tile Drainage in Crop Production" by F. L. Ferguson, B.S.A., of the Ontario Agricultural College, Guelph. Mr. G. E. Armstrong, of Fletcher, Ont., lead the discussion on this paper and advocated the amendment of the existing Tile Drainage Act to provide for the sum of $200,000, instead of $100,000, to be loaned to farmers annually for drainage improvements, as one of the main difficulties the manufacturers of tile were up against was the farmer's lack of finances. He also mentioned the existing high freight rates on tile goods and advocated a movement on the part of the association to obtain a lower rate. Mr. W. McCredie's views on these matters concurred with Mr. Armstrong's and he felt that the farmers of Ontario were not taking advantage of the benefit to be derived largely on account of the above reason.

Mr. J. W. Sands, of Chatham, Canadian representative of the Buckeye Ditcher Company, spoke briefly on the machine which this company manufacture for clay plant work and quoted figures showing the great saving which the installation of excavating machinery brought about even in plants of small capacity.

"Making Soft Mud Brick" was the title of Mr.

James P. Martin's paper, read at this session, which traced the manufacturing process of this type of brick as carried out in the plant of the Lancaster Iron Works, at Lancaster, Pa. He spoke very favorably of the automatic brick machine and referred to the wonderful production results that had been obtained in several U. S. plants with this machine.

Permanent Exhibit of Building Materials

Mr. Brett, of Building Material Exhibits, Ltd., a new firm organized in Toronto recently for the establishment of a permanent exhibit in the new Federal Building, spoke briefly to the members, outlining the scheme which his company is putting through in providing a permanent headquarters for building supply firms in Toronto. This scheme will be fully outlined in an early issue of the Contract Record.

Moving pictures of modern conveying systems for large plants were shown by the American Equipment Company, at this session. These were excellent pictures, displaying how these modern machines have simplified the important factors of conveying the brick to the drying racks and the loading on trucks for shipment.

Following the noon-day luncheon on Wednesday, Mr. T. A. Randall, Indianapolis, secretary of the National Brick Manufacturers' Association, addressed the delegates briefly and invited them to attend the convention of that association to be held in Cleveland, Ohio, the week of February 5.

Mr. R. B. Morley, secretary of the Industrial Accident Prevention Association, also gave his address on "Compensation," which was postponed from the morning session. This is abstracted elsewhere in this issue.

On Wednesday afternoon the delegates visited the plants of the Canadian Libby-Owens Sheet Glass Co. Ltd., Canadian Porcelain Co. Ltd. and R. Campbell's Sons, Ltd. and spent a very interesting afternoon inspecting the manufacturing processes of these three Hamilton industries.

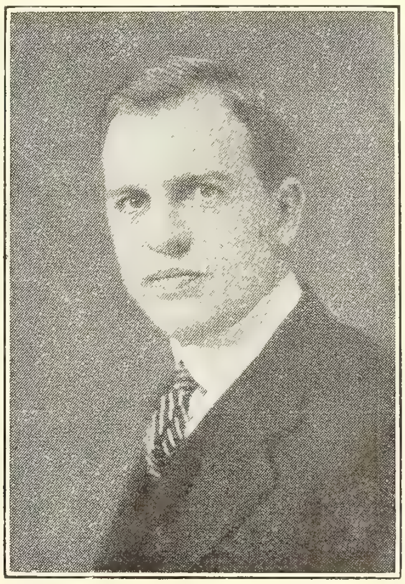
The Annual Banquet

At the annual banquet of the Association, held on Wednesday evening, Sir Henry Drayton, ex-finance minister, was the principal speaker. "I am here to represent the Hon. Mr. Fielding," he said in humoroue vein, "and I request that you pay your taxes promptly and cheerfully. You were asked to lick the Germans and you did it, now you are asked to lick stamps. Every dollar you can give is needed and even more." Despite rumors to the contrary Canada was in good shape, said Sir Henry, and he referred to Premier King's first speech from the Throne to bear out this contention. Canada had suffered during the war, and also from industrial depression, but was better off than any other nation in the world to-day, he said in conclusion.

Other speakers included Rev. Dr. S. Banks Nelson, of Hamilton; Chas. A. Bowen, assistant to the president of the C.B.M.A., of Cleveland; Mr. Andrew Dods and the president, Mr. Ryland H. New. The hotel orchestra was in attendance and a program of songs and musical selections was rendered by several high class local concert artists.

The election of officers at Thursday morning's session resulted in last year's officials being appointed for another year. These are: President, Ryland H. New, Hamilton; first vice-president, T. H. Graham, Inglewood, Ont.; second vice-president, Andrew Dods, Mimico; third vice-president, D. C. Merkley, Ottawa; secretary-treasurer, Gordon C. Keith, Toronto; auditors, Andrew Dods and C. B. Lewis. All of last year's councillors are included in the new council, with a few additions, the new body consisting of Messrs. H. S. Hallatt, Tilbury, Ont.; N. T. Gagnon, Montreal; C. B. McFarren, Toronto; C. B. Lewis, Toronto; Robert W. New, Hamilton; J. W. Nicholson, Toronto; Chas. H. Wallace, Toronto; J. R. Price, Humber Bay, Ont.; A. U. Cote, Cooksville, Ont.; H. F. Dingledine, Aldershot, Ont. The following committees were also appointed: Entertainment Committee—C. A. Millar, chairman; A. U. Cote, William Burgess, Thos. Kennedy, Frank McCannell, R. Butwell, Ryland H. New, G. C. Keith, T. H. Graham, Robt. W. New, C. H. Wallace. Technical Education Committee—Wm. Burgess (chairman), Thomas Kennedy, Jos. Keele, W. McCredie, C. S. Parker, F. B. McFarren, Ryland H. New, H. F. Dingledine, G. B. Armstrong, H. H. Hallatt, J. W. Nicholson, W. H. Freeborn and G. C. Keith. Tile Committee—H. H. Hallatt (chairman), Thomas Kennedy, M. F. Gibson and G. C. Keith.

Several interesting papers were also read at this session, including "Burning Clayware with Oils" by D. S. Gallagher, of the National Products Co., East Liverpool, Ohio; "Steam Shovels" by Frank R. McCannell, of Milton, Ont.; "Insurance" by W. May, Jr., of the Sun Life Assurance Co.; "Crushers" by Thos. Hibbins, of Willsville, Ohio, and "Kinks in the Manufacture of Hollow Tile" by H. F. Dingledine, superintendent of the National Fireproofing Co.



Ryland H. New, president of the C.N.C.P.A.

At the final luncheon on Thursday, Mr. Frank D. Laurie, local manager of the Bell Telepohne Company, spoke on "Telephone Service" and two operators of the company gave a practical demonstration of the workings of an exchange, the method of receiving calls and making connections.

After luncheon Mr. H. F. Dingledine answered many questions submitted by the members during the convention on various matters in connection with the clay industry. The afternoon session was very short, coming to a close shortly after the presentation of the report of the Resolutions Committee.

An interesting feature in connection with the convention was the display of materials in Peacock Alley, near the banquet hall, where all the sessions were held. The following companies' exhibits were included in this display: National Fireproofing Company of Canada, Ltd., Canadian Pressed Brick Co. Ltd.; Canadian Porcelain Co. Ltd.; Hamilton Pressed Brick Co. Ltd.; Foster Pottery Co. Ltd.; Dominion Sewer Pipe & Clay Industries, Ltd.; Hamilton & Toronto Sewer Pipe Co. Ltd.; Elk Fire Brick Company of Canada, Ltd., and the Progress Brick & Machine Co. Ltd., the latter firm showing their Progress Attachment for attaching to brick machine, making it possible to manufacture rough texture brick on the ordinary machine.

The 21st Annual Convention of the Canadian National Clay Products Association and The Western Ontario Clay Workers' Association was a success from every standpoint. The attendance was large, the quality of the papers and addresses rendered at the various sessions was of the highest order and the discussions following these were lively. Doubtless, the members carried away with them many excellent ideas in the operation, management and equipping of modern clayworking plants and thereby the objects of the convention were achieved.

The Importance of Accident Prevention

The Only Relief from Workmen's Compensation Costs is an Adoption of Measures to Decrease Mishaps—Assessments are Determined by Accident Experience

By R. B. MORLEY

General Manager, Industrial Accident Prevention Association

Before the Canadian National Clay Products Association

It will, no doubt, be a shock to a great many of you to know that, in the year 1922, 50,411 accidents were reported to the Workmen's Compensation Board, and that, of this large total, 418 of the accidents were fatal. It is perhaps fortunately a fact that none of us at this meeting to-day can realize the amount of suffering that is bound up in these figures, and this calls to my mind the thought that there are two sides to accident prevention work; first, the humanitarian side, and second, the cost of accidents. On either of these two counts any employer is fully justified in devoting a very considerable portion of his energy to the very important work of preventing accidents.

In presenting accident statistics for consideration of your Association, designated as Group 3, Class 6, under the Workmen's Compensation Act of Ontario, consideration should first be given to assessment rates. These assessment rates are, of course, determined solely by accident cost year by year, hence an increase in accident frequency and severity makes for an increased assessment rate, while a reduction in frequency and severity, on the other hand, will show a decrease in rates.

Class 6, Group 3

	Adjusted 1920	Provisional 1921
Brick, tile, terra cotta, fireproofing, sewer pipe or roof tile manufacturing	$1.50	$1.50
Porcelain or pottery manufacturing	.70	.70

	Adjusted 1921	Provisional 1922
Brick, tile, terra cotta, fireproofing, sewer pipe or roof tile manufacturing	$1.50	$1.50
Porcelain or pottery manufacturing	.70	.70

These rates, you will note show no variation for the years mentioned and are rather good proof that the Compensation Board is not groping in the dark, but in reality is making mighty close assessments in their provisional rating. I am, however, very much concerned with the experience of your group and class for the past year, and anticipate an increase for the coming year. The expectation is based on accident reports received, but as this information does not include costs, these expectations are in reality a matter of intuition.

Realizing that your compensation costs are determined by accident experience, I would ask you to consider the definition of the word "accident" as found in Webster's Standard Dictionary, "A happening; an event that takes place without one's foresight or expectation; an event which proceeds from an unknown cause and is therefore not expected; that which takes place or begins to exist without an efficient intelligent cause and without design."

Accepting this definition of the word "accident" I would again ask consideration of an analysis of so-called accidents from a primary cause, for which definite cause, a definite remedy may be found to counteract. The following figures are taken from accident reports received at my office in 1922 and deal with group 3 of class 6:

Handling material	23%
Falls of persons	20%
Mechanical	12%
Moving trucks, vehicles or animals	12%
Falling objects	11%
Dangerous substances	6%

The Human Element is Responsible

You will note "Handling of Material, 23%" is the most prolific cause of accidents. This cause is always a safe index of the personal make-up of injured employees. The second cause "Falls of persons, 20%" in your line of business is, in many cases, the result of unsafe conditions, but is covered more directly by the human element or personal make-up. Considering the third common cause, "Mechanical, 12%, little remains to be said, for in almost every case conditions can be made practically fool-proof by proper physical guarding. In passing, I might mention that employers of the metal stamping group under the Act succeeded in cutting the assessments in two for the last year, and will, I fully expect, show a further reduction this year. It is quite logical to suppose that if the most hazardous mechanical trade, in spite of ever-changing mechanical conditions, can accomplish results such as this, your industry, with comparatively few, simple, mechanical hazards, can do more. Will you?

Moving on again to the fourth cause of accidents, "Moving trucks, vehicles and animals 12%," we find the human element quite noticeable and the greatest contributing factor. Concerning the fifth common cause of accidents, "Falling objects, 11%," the contributing cause again is usually the human element, but as the person injured has usually no actual control over the cause, this classification is made, although improper handling of materials by other employees is quite noticeable. In analysing "Dangerous substances, 6%," although you may, at first thought, associate this cause with explosives, such is not the case, as this frequently consists largely of burns.

Remedies

Still remembering the definition of the word "accident" you can easily appreciate the fact that only an infinitesimal proportion of these injuries are accidents in the true sense of the word. Such being the case, information on prevention is quite in keeping. This can be summed up in one word "supervision"—supervision even to the elimination of individuals whose high hazard to you is caused through personal carelessness and indifference to their own safety, the safety of their fellow employees, and the welfare of their dependents. These personal hazards, you, as employers under the Workmen's Compensation Act, must assume. This solution you may consider drastic and extreme, but I am quite sure that you will find very few cases indeed where elimination is necessary if due care is given; first, to employing suitable help; second, education of the help after employment, to attendant dangers; third, warning when carelessness is first evidenced, and a full understanding at that time that continued carelessness will result in dismissal. Then, if these means are not successful, you are quite justified in applying the final remedy.

I would like to cite a direct illustration. If you or I approach the representative of any life insurance company for the purpose of insuring our lives, the first step taken by the agent is an examination by a competent physican to determine if our physical condition is such as to warrant the company underwriting the risk. If this examination is satisfactory, the policy is then written. If not, the application is refused. Workmen's compensation is an exact parallel, with the employers of any class underwriting the hazards of the employees of that class. As a business organization your class or any other class cannot afford to assume high personal hazards of employees, unless at the same time you are quite willing to face an increase in compensation assessments.

Referring back to the question of supervision and discipline, I feel that too much stress cannot be laid on this factor. I think that it is a fact that the average employer, with labour in its present condition, can have just as much safety in his plant as he is willing to insist upon.

In closing, I should like to leave with you the thought that compensation benefits in Ontario are not likely to decrease and are more likely to increase, although there is no present indication of this. My reason for making this statement is that I am anxious that you should all realize that employers whether in the province of Ontario, or any other province in Canada, or state in the Union, have only one relief from compensation costs, and that is accident prevention.

Letters to the Editor

Architect Replies to Criticisms

Editor, Contract Record,

Re "Archombldr's" criticism of your house suggestion No. 50, in the January 3 Contract Record, page 20:

One welcomes intelligent criticism, but there are good answers to all his objections. For instance he says, "without a doubt, when a dining room is omitted, there should be a commodious breakfast or dining alcove:"—a makeshift, a dining room in miniature, I suppose. But he is wrong. The dining room is not omitted in this case, but is merged in the general purpose room called the living room. Economy in household work (to use his expression) demanded it so. The proximity of this end of the room to the sideboard, serving pantry and kitchen make it most convenient and labor-saving.

Again he says, "there is too much lost room along the side wall between the hall and back door." Every foot of this space is utilized, however. In fact it happens that the very points he picks out as badly arranged are good features of this compact little home, which were deliberately planned. There are some people of course, who prefer a vestibule in which even one person cannot remove an overcoat without bruising his knuckles on the walls. Some houses are built by so called "home builders" even in Toronto, without any vestibule at all, and the summer purchaser finds to his chagrin in the winter that snow and ice and mud must be taken into the house along with the cold blast which is admitted to the interior every time the front door is opened.

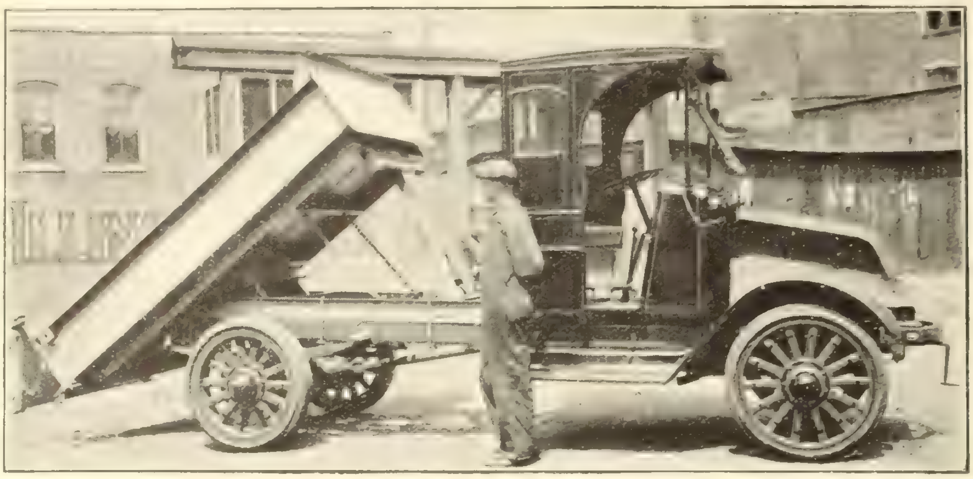
There are also some people, who prefer the stereotyped staircase, which gets mixed up at the start with the vestibule door and climbs with one straight flight to the floor above; and have a liking for stairs which expose themselves to the street when the front door is opened. As a matter of fact, the staircase and landing forming the gable over the entrance is the best bit of planning in this house and best appreciated by the owner. But this critic overlooks a real blunder when he does not notice the toilet door opening in full view from the staircase, instead of around the corner.

The criticism of the position of the kitchen chimney is immaterial; a fireplace in the small library is not required and would take up too much room; besides these are the days of electric heating of such rooms as this.

"Archombldr" can disabuse his mind about the living room not being well lighted. "The proof of the pudding is in the eating" and "seeing is believing." Finally the view in this case up and down the street is not sufficiently attractive to have any regrets at losing. In front, however, there is a pleasing prospect.

For the welfare of domestic architecture, it would help much if more small houses received the study in planning which this one received to suit the needs of the owner. The Contract Record is to be commended for its enterprise in publishing this series of suggestions.

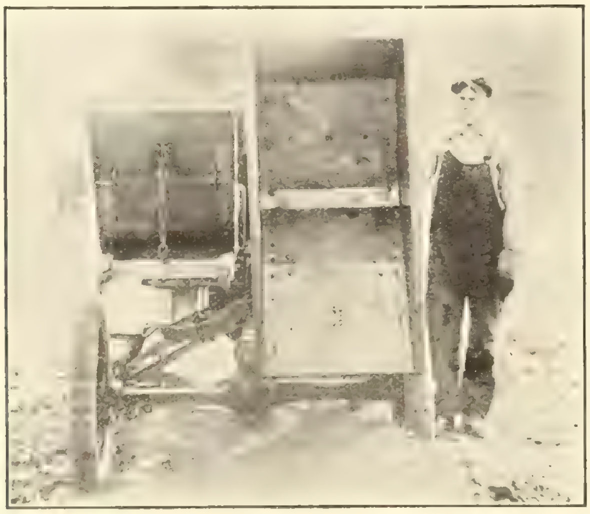
Architect of No. 50.



Dominion automatic end dump utility body.

possible this central plant is located approximately half way along the pavement which is to be laid. The charge of gravel, sand and cement is loaded into the body at the storage bins, carried to the paving machine on the roadway and dumped directly into the mixer skip without rehandling.

Wet Mix Method—With this method the materials are mixed at a central mixing plant with a stationary mixer. The mixed concrete is hauled and deposited just where it is needed on the job. The length of the haul must not be greater than a truck can run in thirty minutes; otherwise the concrete will set. But light trucks will run from six to ten miles in 30 minutes. Owing to the steep dumping angle (70 degrees) of Dominion hopper bodies the whole load is dumped cleanly upon the ground.



Dominion dual hopper automatic dump body

The single end dump hopper body is made of No. 10 gauge sheet metal. The sub-frame is of standard structural steel shapes. Riveting, both on hoppers and sub-frame, is of special importance and is the secret of a long lived ad durable body. For this reason all parts are joined with large sized rivets driven hot. Single hopper bodies are made in sizes from 1 to 3 yard capacity.

The dual hopper type is similar in construction to the single hopper but each hopper can be dumped separately and the truck on which they are mounted can carry two full charges for the mixer skip. Dual hopper bodies are made in sizes from ½ yard up to 1½ yards for each hopper.

Another type of body which this firm is bringing out is the Dominion utility end-dump body. It is a dump and express body in one. It hauls anything, dumps without power and has no hoist. By pulling a lever the body rolls over and dumps and the end gate opens automatically. The driver does not need to leave his seat. This general purpose dumping body is especially useful because of its low shovelling height. This body is made in capacities from 1 to 5 cubic yards and the capacity of each individual body can be increased by the use of side boards. Where an all purpose body is needed these bodies can be provided with stakes, giving a dump, express and stake body in one.

The three different types of bodies herein described are manufactured by the Dominion Truck Equipment Co. Ltd., Kitchener, Ont., to suit every make of truck.

Rilett Bros. Have Expanded

Messrs. Rilett Bros., formerly of 1366 King St. W., Toronto, have opened up new offices at 253 Confederation Life Bldg., Toronto. This firm previously carried on the business of transportation contractors solely, but have extended their activities to include excavating and the complete handling of materials—loading, transportation and unloading—on road and excavating contracts. The company is equipped to handle any job in this line and have executed several large transportation contracts in Toronto and district, among which was the conveying of materials on a road construction contract on Kingston Road, in the vicinity of West Hill, last summer, where they operated a fleet of 15 Packard trucks. They have just been awarded the excavating contract for the new $1,337,000 repair shop of the Toronto Transportation Commission and a smaller contract for the new Gerrard St. Methodist Church at the corner of Spruce and Sumach Sts., Toronto. Messrs. L. R. Rilett and P. S. Rilett are the principals.

On to Quebec for the Construction Conference—February 6-9!

There are many reasons why the coming fifth conference of the Association of Canadian Building and Construction Industries promises to be of special interest to those who may attend as delegates, but not the least is the opportunity the trip will give to see the beautiful and historic Ancient Capital in its winter garb. On the Dufferin Terrace, 182 feet above the St. Lawrence, there will be sports of various kinds, including sliding, skating and curling, and in addition, there are many beautiful drives which can be taken in comfort in one of the well-appointed cab-sleighs. Beautiful as the city is in summer, when the ordinary tourist usually sees it, it has a charm peculiarly its own in the winter-time, and each season sees an increasing number of visitors from other parts of Canada and distant parts of the United States coming to partake of the wholesome fun of the annual mid-winter carnival.

The visitor to Quebec will, however, have many other most interesting features brought to his attention during his stay. He may take short side-trips by sleigh or train to the shrine of Sainte Anne de Beaupre, visit the Montmorency Falls, or run out to the Quebec Bridge, the longest cantilever bridge in the world. For the one who is inclined to brush up his history, every corner in the older portion of the city has some particular attraction. He may stand on the same ground where Bagot or Frontenac ordered their followers around, may worship in the same churches where Montcalm and his captains attended mass, or go down some of the narrow, winding streets of the Lower Town, under the shadow of the great cliffs and the now empty threat of many an ancient cannon, to make his purchases in little old-world stores.

The City's Growth

The city has a very modern side, also. Its population in 1665 was 547, and in 1921 it was estimated at over 110,000. In 1910, the building permits were $526,498, and in 1921 reached $3,693,397. The annual bank clearings are well over 300 millions of dollars, and the duty collected in the port over $4,700,000. In the harbour, there are about 56 acres of docks, two grain elevators, two graving docks, one of which is capable of taking the largest vessels afloat. The city is the centre of Canada's boot and shoe industry, and a trip through one of the factories will well repay the effort. Nine steam railways enter the city, and there is a well equipped street railway, connecting also with two interurban lines.

The legislative buildings, the city hall, the churches and seminaries all attract the visitor, and he will also find it worth his while to see the large fur stores, where the choicest trophies of the far north are on view.

Nor need there be any doubt as to one's comfort, during the stay in the city. The Chateau Frontenac, built on the site of the old historic Chateau St. Louis, is operated by the C.P.R. system on the most up-to-date lines. Every provision is made for the comfort and welfare of the visitor. At the present time, a twenty-storey addition is being constructed, which it is expected will be completed early this coming summer, and it is safe to say that the view from the tower of the new portion will be unsurpassed in the world, providing a wonderful panorama of rivers, bays and mountain slopes.

An Unusual Opportunity

An occasion such as the conference of the Association of Canadian Building and Construction Industries gives the members of the building and construction industry an opportunity not only to get together, but to become acquainted with this portion of their native land at an especially attractive time. It is usually impossible for a contractor, or the manufacturer and supplier of building materials, to leave his business for any length of time during the summer season, when construction is active, but the opportunity of seeing old Quebec in one of its most beautiful moods, and of attending the fifth annual conference, is given at a time when it is easier to get away from business cares. It is safe to say that the delegates who go to Quebec on February 6 to 9 will not only have the privilege of discussing some of the live and important questions affecting their business, but in the contact with the quaint customs and picturesque surrounding of old Quebec will experience a charm long to be remembered.

Machinery & Equipment

During the past season of busy construction work many contractors have been asking themselves this question. Is my hauling equipment giving me the utmost in economic and efficient delivery of my materials? So these contractors have investigated the new ideas along this line and have found that, measured on a basis of cost per hour per ton mile, the smaller trucks equipped with automatic dump bodies have been the answer in their particular case.

Bodies of this type are being made in Canada by the Dominion Truck Equipment Company, Kitchener, Ont., and contractors who have used them state that they have not only reduced their hauling and mixing costs from 40% to 50% but have also greatly increased the amount of yardage laid.

The handling of cement, sand and stone on concrete paving work, should receive the contractors greatest personal attention. Tremendous savings may be affected by means of proper plant and organization. This is true whether the paving in question is a true concrete pavement or whether it is the base course of concrete for a brick, asphalt or block pavement. It is true also whether the job in question is a country highway or city street.

Following is a brief explanation of the two methods commonly used.

1. **Dry Aggregate Method**—Materials are usually delivered by cars or otherwise to some central storage plant where they are stored in bins or piles. If

The Contract Record's

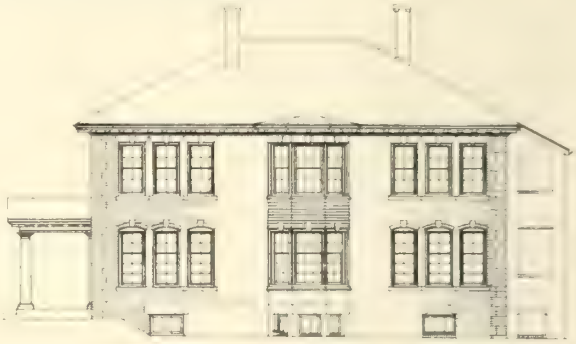
Weekly House Suggestion No. 54

Our subject this week is an interesting example of the duplex house, incorporating large living room, dining room, sunroom, kitchen and two bedrooms, ample accommodation for a small family, on each floor. There is a common entrance at the front to the two flats, giving the house the general appearance of a single residence, a desirable feature in a duplex. We are only showing the ground floor plan, as the above is an exact duplicate.

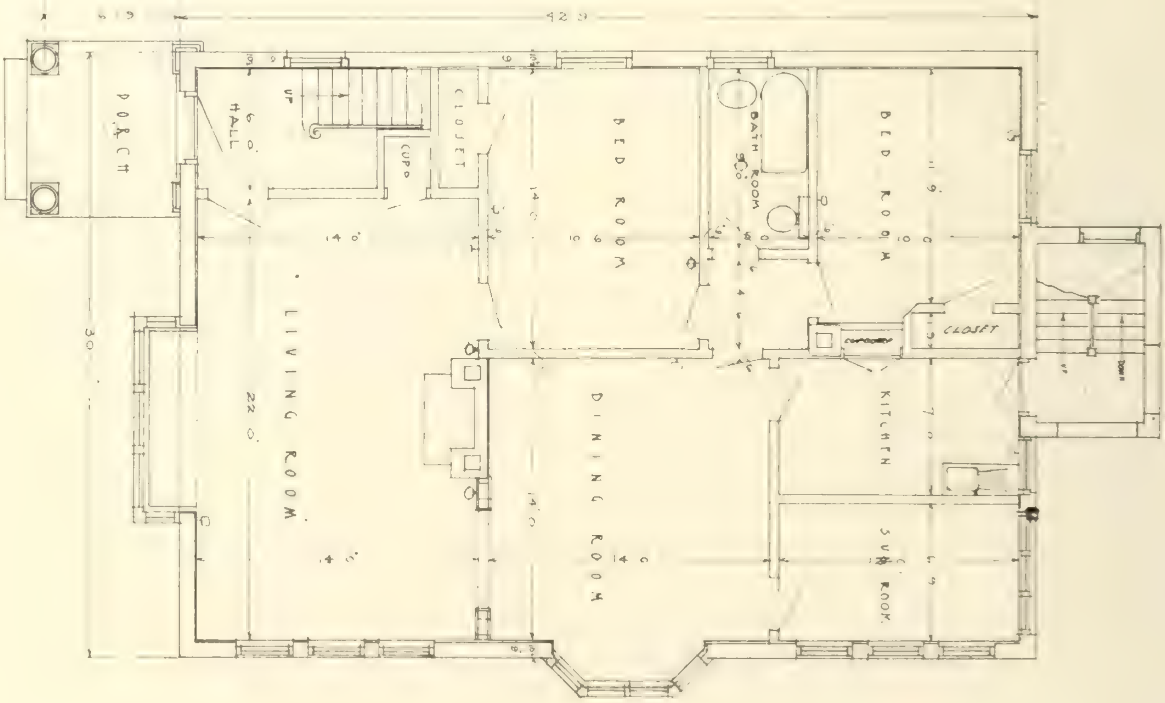
The outside construction is of pressed brick, with stone trim around windows and main entrance. The roof is of stained wooden shingles and the front porch is of wood construction. A glance at the plan will show that the rooms have been carefully laid out, providing for a large, bright living room at the front, equipped with brick mantel in the rear wall between the dining room and bedroom entrances. The entrance to the dining room is open and has been specially treated with wooden pillars on either side. The dining room also has direct entrance on sunroom, kitchen and the small square hall between the two bedrooms. Although the kitchen space is ample for a dwelling of this size, should more space be desired, the sunroom could be eliminated and this entire space be utilized for a kitchen. Entrance may be had on kitchen through porch at the rear. The bedrooms are large and are both equipped with a roomy closet. The bathroom location is ideal in this layout. The trim throughout has been finished oak and the flooring in living room, dining room and sunroom is of oak. The flooring in the two bedrooms and kitchen is of pine. Every available bit of floor space has been utilized and the entire plan suggests economy and convenience in design.

The basement has been divided into two equal sections, with separate heating plants. The occupants of the upper floor have access to their basement quarters by staircase in rear porch.

Mr. J. W. Siddall, architect, of 250 Confederation Life Building, Toronto, is the designer of this house.



SIDE ELEVATION



Mainly Constructional

East and West—From Coast to Coast

The annual convention of the Dominion Land Surveyors' Association will be held in Ottawa on February 7 and 8. Reports covering the work of many prominent surveyors during the past year will be presented. G. H. Herriot, of Ottawa, is this year's president.

Messrs. Anglin-Norcross, Ltd., of Montreal, have secured the contract for the construction of the new Ford assemply plant on Danforth Ave., Toronto, and construction will go ahead immediately. The contract calls for the erection of a one-storey motor assembly building, 500 x 400 ft. and a power house, 120 x 50 ft. These buildings will be of structural steel. Provision has been made in the plans for the erection of additions to these buildings as the demand arises. The cost of the first two structures will be in the neighborhood of $400,000 and the ultimate cost of the development, including land, is estimated at $1,000,000.

The following nominations have been made by the nominating committee of the Montreal Builders' Exchange, which, it is expected, will be accepted without opposition at the annual meeting: For president, Douglas Bremner; hon. treasurer, J. E. Walsh; hon. secretary, A. Plamondon. Branch nominations for the board of directors so far are: General Contractors' Section, E. B. Evans, John Quinlan, C. Cook; Supply Dealers' and Manufacturers' Section, A. T. Alexander, A. W. Bremner, J. P. Dupuis and C. K. McLeod; French Section, Arthur Leclaire, M. Chouinard and J. P. Abel.

For the purpose of discussing scientific and industrial research the Canadian Manufacturers' Association has arranged for a conference at Ottawa, on February 20, 21 and 22. Co-operation in this has been promised by the advisory council for scientific and industrial research, and the support of the principal Canadian universities has been secured.

It is reported that Hon. J. H. King, Minister of Public Works, is planning to submit to the Dominion Government for approval a suggestion to build a new government block on a site owned by the government at the corner of Bank and Wellington streets, Ottawa, to house a number of government offices now occupying rented quarters throughout the city. It is understood that a building large enough to meet these requirements would cost in the neighborhood of $2,000,000.

The Quebec branch of the Engineering Institute of Canada held a branch meeting at the Chateau Frontenac a few days ago which was presided over by Mr. A. R. Decary, president, and attended by over fifty members. The speaker of the day was Mr. Gabriel Henri, Consulting Engineer of the Provincial Roads Department, who read a very interesting paper on the "Kinetic Energy of the Air and Its Possible Utilization."

The Association of Land Surveyors of Manitoba held their annual convention in Winnipeg recently and the new officers for the year 1923 were appointed as follows: President, Allen Findlay, Portage la Prairie; vice-president, G. A. Warrington, Winnipeg; secretary-treasurer, R. H. Avent, Winnipeg; members of the executive council for two years, S. S. McColl and H. E. Beresford, both of Winnipeg; auditors, J. B. Scott and D. N. Sharpe, both of Winnipeg.

The Manitoba Association of Architects elected the following new officers for 1923, at their annual meeting held recently: George Northwood, president; Donald Ross, vice-president, and E. Fitz Munn, secretary-treasurer. They, with the following, constitute the council of the association. Messrs. C. S. Bridgman, C. W. Chivers, J. Halley, E. Praio, J. H. G. Russell, J. Smart, and J. N. Semmens.

The Quebec Basilica destroyed by fire recently will be rebuilt according to the original plans. The walls left standing after the fire will be used for the new structure and when finished the edifice will be an exact replica of the ancient church as it appeared before the fire. The new church will be constructed of fireproof material.

Personal

Ald. Gordon B. Drake was elected chairman of the Town-Planning Commission of London, Ont., at the inaugural meeting at the city hall a few days ago.

Mr. A. Livingston, formerly connected with the architectural firm of Bodley & Livingston, of Brantford, has opened up an office in Lansdowne Park, Brantford, and will carry on the practice of architecture.

Mr. Hugh Logan, Glenwilliams, Ont., has taken over the business of the Terra Cotta Brick Co. and will open for business about April 1st.

Hon. George S. Henry was recently elected Chairman of the Toronto and York Roads Commission, succeeding Reeve William Keith of Newmarket, who had been Chairman for the past two years. Mr. Henry is the only member of the commission who has sat continuously since the commission was inaugurated in 1911. Other officers elected at the annual meeting were: Vice-Chairman, J. M. Gardhouse, Reeve of Weston; Secretary, R. W. Phillips; Treasurer, D. J. Macdonald; Engineer to the commission, E. A. James. During the past year the commission spent approximately $600,000 on the roads of the county. There are now more than 180 miles of paved roads in York.

The re-numbering of Bay St., Toronto, since it has been extended, has changed the office address of Mr. J. M. Cowan, architect to 911 Bay St. It was formerly 107 St. Vincent St.

Obituary

Mr. Gordon Elmslie, civil engineer of Westmount, P.Q., and one of the designers of the Quebec Bridge, died recently in Montreal. Deceased was born in Hamilton in 1849 and was educated at the University of Toronto. He was connected with the Dominion Bridge Company, of Lachine, for 30 years in an engineering capacity.

Mr. Herbert John Erskine Keys, aged 41 years lost his life in a motor collision near Chatham, Ont., a few days ago. He was an engineer by profession, and had latterly been engaged in buying land for the Ontario Highways Department. Mr. Keys was a graduate of Upper Canada College, and of the University of Toronto, where he took his degree in 1906. He followed his profession in South America, British Columbia and Northern Ontario until the outbreak of the Great War. Enlisting in October, 1914, as a private in the Engineers, he served in France four years returning to duty after being wounded.

Trade Incorporations

Belmont Construction Co. Ltd., with head office at Montreal, capital $500,000, to carry on a general contracting and engineering business.

John Maloney, Ltd., with head office at Toronto, capital $40,000, to carry on the business of dealers in stone, brick, timber, and other building materials.

CONSTRUCTIONAL ACTIVITY

Period of Jan. 24 to Jan. 30, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Kingsville, Ont.
Watermains, sidewalks and pavements to cost about $60,000 contemplated by the Town Council. Engineer is R. W. Code, Chatham St.

Korah Twp., Ont.
Roadwork to the extent of $8,000 will be commenced shortly and will be done by day labor. R. M. Moore, clerk.

London, Ont.
City will be in the market for road oil in a few weeks. H. A. Brazier, engineer.

Paisley, Ont.
Council plans to overhaul and make extensions to the waterworks system. J. C. Gibson, clerk.

Preston, Ont.
Pavement contemplated by the Town Council. Work will go ahead in the spring. George Wurster, clerk.

Province of Ontario,
Provincial Government will receive tenders until Feb. 26 on concrete pavement, asphalt concrete pavement, macadam roadway, macadam base course, grading and concrete culverts as advertised on page 54, January 24 issue of the Contract Record.

CONTRACTS AWARDED

Toronto, Ont.
City of Toronto has awarded W. E. Taylor, Falcon St. a contract for sewers at $15,437.

Winnipeg, Man.
The city engineer is handling the general contract for sewers costing $16,066. C. J. Brown, city clerk.

Baird & McCurdy, Portage Ave., have a contract for sewer pipe for the city at a cost of $4,482.

Railroads, Bridges and Wharves

Brantford, Ont.
Lee & Nash, Temple Building, will receive tenders until Feb. 1 for 80 piles to be delivered at Mount Vernon Bridge.

Grand River, Que.
Tender are wanted by the Dominion Government for an extension to a wharf. Will be received until Feb. 22. R. C. Desrochers, Ottawa, secretary.

Grande Mere, Que.
Canadian Bridge Co. Ltd., Birks Building, Montreal, and Dominion Bridge Co. Ltd., Lachine, have submitted plans and estimates for the $325,000 highway bridge at Grande Mere. E. B. Waldie, c/o Laurentide Co., engineer.

Hamilton, Ont.
New tracks contemplated to the Half-Way House, 3 miles, by the Dominion Power & Transmission Co. Ltd. G. Waller, manager.

Waldo, B. C.
Bridge of wood construction, on a concrete foundation, proposed by the Provincial Government. Estimated to cost about $6,000.

West Flamboro, Ont.
New tenders will be called in the spring on a bridge in the 8th concession. F. A. Corman, West Flamboro, clerk. J. W. Tyrrell & Co., Hughson St., engineer.

Public Buildings, Churches and Schools

Belleville, Ont.
Work has been suspended until April on a theatre and stores being built by J. C. McCarthy. All materials not yet purchased. Contracts for carpentry, steel, roofing, plumbing, heating, plastering, electrical work and painting to be let.

Brantford, Ont.
Plans for a $50,000 addition to the hospital are being prepared by Wm. Tilley, Temple Bldg. A. K. Bunnell is the secretary.

Chatham, Ont.
Prices on 120 desks and 4 blackboards are wanted at once by J. P. Dunn, secretary of the Separate School Board.

Delhi, Ont.
Town Council contemplates a town hall at a cost of $20,000. Jas. Lawson, clerk.

Ennismore, Ont.
The plans for the $60,000 church are being revised. A. W. Holmes, St. Joseph St., Toronto, is the architect. Rev. J. V. McAuley is the parish priest.

Etobicoke Twp., Ont.
Tenders for the balance of the work on Etobicoke school, costing $35,000 will be called for by Walker and Gibson, architects. Toronto.

Fonthill, Ont.
Public School Board contemplates rebuilding the school. Sec. A. Clarke.

German Mills, Ont.
Centerville School Section has had plans drawn for a school to cost about $6,000. W. C. Cowan, King St., Kitchener, Ont., architect. G. A. Weber, German Mills, secretary.

Hamilton, Ont.
Alteration to a hospital contemplated by the City Council. Chairman of the Hospital Board, P. H. Pratt.

Pennington & Boyde, Bartlett Bldg., have prepared plans for repairs to St. Mary's Cathedral at a cost of $10,000.

Ham Sud, Que.
School Commission contemplates a $3,000 building. J. E. Sylveslie, St. Adrien St. is the secretary-treasurer.

Hull, Que.
Zion Presbyterian Church contemplates a new edifice Pastor, Rev. Wm. MacMillan, Front St..

Kingsville, Ont.
Nicholson Transportation Co., Detroit, is interested in the remodelling of the "Groverdale" hotel. If the by-law being submitted to the ratepayers granting a fixed assessment is carried, a bath house, dance hall, will be built and alterations to the extent of $10,000 will be made.

London, Ont.
Tenders will be called for about Feb. 1 by the Board of Education for a $30,000 addition to a school. L. E. Carrothers, architect.

Tenders are being received by the secretary of the Board of Education for supplying 300 folding chairs. No closing date set.

Millbrook, Ont.
About April 1 work will commence on the $22,000 addition to Millbrook School. McIntyre Bros. are handling the general contract. W. H. Barry, George St., Peterboro, is the architect

Milton, Ont.
An addition to the Grandstand is contemplated by the Horticultural Society. A. L. MacNabb, secretary.

Montreal, Que.
J. Sawyer, Guy St., has prepared plans for the completion of a church and presbytery. Rev. J. A. Papineau, Amherst St., priest.

Niagara Falls, Ont.
Plans and specifications for the proposed $80,000 addition to a Public school will be submitted to the board at the February meeting. If approved tenders will be called for shortly.

Norwich, Ont.
Citizens' Committee plans to erect a Community Hall with a gymnasium. Committee to secure estimates. Rev. T. B. Holland, secretary.

Ottawa, Ont.
Dominion Government Department of Public Works contemplates a large office building on Victoria St. R. C. Desrochers, secretary. Parliament Buildings.

Quebec, Que.
Tenders for the rebuilding of the Basilica will be called for shortly. Tanguay & Chenevert, D'Aguillon St., architects.

Sackville, N. B.
Dominion Government Department of

Public Works, Ottawa, contemplate a post office. R. C. Desrochers, secretary.

St. Andre, Que.
In May alterations will be made to the presbytery to the extent of $7,000. Parish Priest is Rev. H. Guy.

St. Barnabe, Que.
Congregation contemplates a $20,000 presbytery. Rev. J. B. Larochelle, priest. Architect will be appointed shortly.

St. Coeur De Marie, Que.
A. Lamontagne, Chicoutimi, Que., wants tenders for furniture and gilding for a church.

St. Laurent, Que.
Viau & Venne, St. Gabriel St., Montreal, are the architects preparing the plans for the proposed extension to College St. Laurent.

South March, Ont.
Alterations will be made to the Anglican church at a cost of $6,000. Rector, Rev. C. Reid.

Terrebonne, Que.
The Dominion Government is clearing the site for a $26,000 Post Office. Emile Lavoie, supervisor, wants price on roofing, furnace, plumbing, metal and electrical fixtures. No material purchased except brick.

Tillsonburg, Ont.
Tillsonburg Amusement Co. are having plans prepared for an arena costing about $12,000. Frank R. Flood, secretary-treasurer.

Toronto, Ont.
G. M. Miller & Co., 93 Yonge St., have been appointed architects to prepare plans for the addition to Danforth Methodist Church. Tenders will be called for shortly.

Separate School Board has purchased a site on Shaw St. and is considering the plans submitted by two architects. Decision will be reached shortly.

Bulk and separate tenders for St. John's Anglican Church will be received by Gordon & Helliwell, Confederation Life Bldg., until Feb. 14.

Danforth Pape Recreation Hall Ltd., plans the erection of a Club House in the Danforth district. G. F. Hatch, Pape Ave., secretary and J. W. Siddall, Confederation Life Bldg., architect.

Toronto Public Library Board, College St., proposes to erect a $35,000 building on Gerrard St. E. Shepard & Calvin, Excelsior Life Bldg., are preparing the plans. E. A. Caswell, secretary.

Toronto Transportation Commission has awarded John V. Gray Construction Co. Ltd., Queen St. E., the general contract for repair shop and storehouse at the Bathurst St. yards at a cost of $1,337,000.

Sketch plans have been drawn for a large extension to Donlands Methodist Church. Rev. R. J. Fallie, Fielding Ave., pastor.

Board has planned an extensive building program for 1923. Included in the estimates is a new Collegiate costing $350,000. An addition to Riverdale Collegiate at a cost of $120,000 is also contemplated while it is proposed to expend $32,000 on the completion of North Toronto, $30,000 on Malvern and building an addition to Kew Beach School at a cost of $26,000. W. W. Pearse, 155 College St., secretary.

Plans are being prepared by J. P. Hynes, King St. W., for a building for St. Peter's Roman Catholic Church.

City will receive tenders until Feb. 13 for shelter buildings in Baird and Stanley Parks. C. A. Maguire, Chairman of the Board.

Vernon, Ont.
Osgoode Baptist Church contemplate a new building at a cost of $14,000. Old building will be wrecked. Sec.-treas., R. J. Robertson, Osgoode, Ont.

Welland, Ont.
Sub-contract tenders will be called for shortly by W. J. Hickey, general contractor, for the Welland Public Library. Miss. D. Forrester, secretary.

York Twp., Ont.
Plans are drawn and tenders will be called for in February for a $50,000—$60,000 Public School in S.S. No. 30. Gordon & Helliwell, Confederation Life Bldg., Toronto, architects. L. W. Archer, 12 North Huron St., Toronto, secretary.

CONTRACTS AWARDED

Burlington, Ont.
W. J. Walsh has the plumbing contract for the Burlington Methodist Church Sunday School.

Charlottetown, P. E. I.
W. R. Doull, Weymouth Rd. has the electrical contract for the addition to the Central Christian Church. The seating contract has been awarded to Beer & Weeks.

Methodist Church congregation wants tenders on an addition to the church at a cost of about $10,000. Harry Smith, County Court Office, secretary-treasurer.

Montmorency Village, Que.
Contracts on the $80,000 college for the School Commission let as follows: Steel, Eastern Canada Steel & Iron Works Ltd.; roofing, J. Faldeau; electrical, J. Menard; plumbing and heating, P. P. Giguere Co. Ltd.

Montreal, Que.
Alf. Perron, Pleiss St., has the plastering contract for a school and residence being erected by the Catholic School Commission.

Contracts on a $210,000 church for the the Syndica de la Paroisse St. Eusse de Verceil, have been awarded as follows: Electrical, W. Rochon, Pk. Lafontaine; plumbing & heating, O. Carson, La Salle St.; metal lathing, E. Dussault, St. James St.; windows and doors, Metal Shingle & Siding Co. Ltd., Delorimer St. Glass furnished by Hobbs Mfg. Co., St. James St.

St. Christophe, Que.
N. Pouliot, Arthabaska, has the general contract for a $3,000 school for the R. C. School Commission. C. R. Garneau, secretary.

Toronto, Ont.
Toronto Transportation Commission has awarded the following contracts for boiler house equipment costing $30,000: Boiler, Engineering & Machine Works of Canada Ltd.; boiler feed pumps, J. T. Hepburn Ltd.; underfeed stokers, Underfeed Stoker Co. of Canada Ltd.; draft fans, Canada Blower & Forge Co. Ltd.; boiler settings, J. H. Wanting & Co.

Vancouver, B. C.
The general contract for a fumigation plant for the Provincial Government has been awarded to Smith Bros. Credit Foncier Bldg. Cost will be about $19,391.

Business Buildings and Industrial Plants

Charlottetown, P. E. I.
S. A. MacDonald, Fitzroy St., is having plans prepared for rebuilding a store at a cost of from $15,000 to $20,000. E. S. Blanchard, architect.

Donnacona, Que.
Donnacona Paper Co. contemplate a pulp mill costing $40,000. J. A. Beauchemin, engineer.

Enniskillen, Ont.
E. Hyatt, R. R. No. 1, Petrolia, will rebuild the $5,000 stock barn destroyed by fire.

Hamilton, Ont.
Tenders will be called about the first of the month and will close on the 14th for a $30,000 printing plant. Warren & McDonnell, Home Bank Bldg., architects.

Leamington, Ont.
Excavating is in progress and tenders are being received on all trades for a store block. A. J. Wahsy, Box 1071, owner.

Montreal, Que.
Dupuis Freres Ltee. St. Catherine St. are having plans for a departmental store revised. Wrecking has been started by W. Lajunesse & Co. and the general contract will be let shortly.

E. A. Doucet, St. Catherine St., is preparing plans for A. Prudhomme & Fils, De Bresoles St., for a building to cost about $250,000. Wrecking will probably commence about May 1 and work on the new building in June.

Gordon Hutkins' Auto Top Co. has just started work on an addition to the repair shop at a cost of $10,000. The general contractor is Gilletz & Co., City Hall Ave.

Work will commence shortly on alterations to a building for the Office Equipment Co. of Canada, Notre Dame St. General contractor, J. Weighton, Grosvenor St.

Mount Dennis, Ont.
Electroplax Co., Toronto, will call for tenders shortly for their plant. H. M. Hyland, Weston, engineer; H. E. Cory, general manager.

Niagara Falls, Ont.
A. Malouf, Bridge St., has indefinitely postponed work on two stores costing $10,000.

Ottawa, Ont.
Cafe costing $4,000 being built by Central Cafe, Elgin St.

Peterboro, Ont.
Plans are being prepared and tenders will be called for shortly for a factory for Brinton Carpet Co. W. R. Thomson, manager.

Port Arthur, Ont.
Addition to Saskatchewan Co-operative Elevator Co's., Regina, elevator at

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

Tenders for Valves

Tenders will be received by registered post only, addressed to the Chairman, Board of Control, City Hall, Toronto, up to 12 o'clock noon, **Tuesday, March 6, 1923**, for the following:

Tender No. 38—42-inch and 36-inch stop valves.

Tender No. 39—36-inch check valves.

Envelopes containing tenders must be plainly marked on the outside as to contents.

Specifications and forms of tender may be obtained at the Works Department, Room 12, City Hall. Tenders must comply strictly with conditions of City By-law as to deposits and sureties, as set out in Specifications and Forms of Tender.

The lowest or any tender not necessarily accepted.

C. ALFRED MAGUIRE, (Mayor)
Chairman Board of Control
5

RATES

20 cents per agate line (14 lines to the inch) Positions Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

CONTRACTORS

Tenders will be received by the undersigned until **February 14th.**, for the various trades required in the erection of

St. John's Church

corner of Humberside and Quebec Avenues, Toronto.

GORDON & HELLIWELL, Architects,
526 Confederation Life Building, Toronto.
5-6

DIRECT CURRENT MOTORS

Kingston Penitentiary

Sealed tenders addressed to, "The Superintendent of Penitentiaries, Ottawa," and endorsed, "Tender for Motors" will be received until

Wednesday, February 28, 1923,

from the parties desiring to purchase any or all of the following electric motors:—

No.	H.P.	Volts	Revolutions	Manufacturer
1	10	110	850 R.P.M	Dick Kerr Mfg. Co.
1	15	110	960 R.P.M	Dick Kerr Mfg. Co.
1	1	110	1725 R.P.M.	Sprague Electric Co.
1	10	110	1100 R.P.M	Peerless Motor Co. (direct connected to fan)
1	10	110	850 R.P.M	Dick Kerr Mfg. Co.
1	10	110	850 R.P.M	Dick Kerr Mfg. Co.
1	5	110	(650 to 1500 R.P.M.)	Westinghouse, no base.
1	35	110	1800 R.P.M	Westinghouse, no base.
1	3	110	1650 R.P.M	Jones and Moore
1	3	110	1100 R.P.M.	General Electric Co.
1	10	110	1400 R.P.M.	General Electric Co.
1	15	110	1150 R.P.M	General Electric Co.
1	30	110	Variable	Westinghouse, (Grids and Controller)
1	10	110	Variable	Westinghouse.
1	1	110		Westinghouse

(Armature will require to be rewound)

Starters Supplied With All Motors

The above mentioned are in good repair and may be viewed at the Kingston Penitentiary, Kingston, Ont.

Terms of sale—cash.

Motors to be removed from the Penitentiary before March 20, 1923.

Papers inserting this notice without authority from the King's Printer, will not be paid therefor.

(Signed) W. St. PIERRE HUGHES, D.S.O.
Superintendent of Penitentiaries.

Department of Justice,
Ottawa, January 25, 1923.
5

The Quebec Streams Commission

Proposed Storage Dams at Lake Kenogami

Notice to Contractors

SEALED TENDERS addressed to the undersigned and marked "Tenders for Storage Dams at Lake Kenogami" shall be received at the office of The Quebec Streams Commission, Parliament Buildings, Quebec, until Twelve o'clock noon, on

Tuesday, the 20th of February 1923.

Plans and specifications can be seen on or after this date at the office of the Commission, 59 Notre Dame Street East, Montreal.

Parties tendering shall be required to accept the fair wages schedule prepared or to be prepared by the Department of Labor of the Province of Quebec, which schedule shall form part of the contract.

Tenderers are notified that tenders shall not be considered unless made strictly in accordance with the printed forms.

An accepted bank cheque for the sum of One Hundred and Fifty Thousand Dollars ($150,000.00) made payable to the order of the Provincial Treasurer, must accompany each tender, which sum shall be forfeited if the party tendering declines entering into contract for the work, at the rates stated in the offer submitted. The cheque of the successful tenderer shall be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By Order
O. LEFEBVRE, Chief Engineer.
The Quebec Streams Commission,
59 Notre Dame Street, East,
Montreal, Jan. 22nd, 1923.

Newspapers inserting this advertisement without authority from the Commission will not be paid for it.
5-7

STEEL PILING

1000 tons 40' long.
14" x 3/8" Arch Web.
7" x 1/4" Straight Web
All ready to load.

UNIVERSAL EQUIPMENT COMPANY,
1 T.f. Niagara Falls, Ont.

Business for Sale

One third interest in going general contracting company. Good plant and A1 reputation. Two thousand cash and balance secured. Must be able to take active interest. Box 108, Contract Record, Toronto.
4-5

WANTED—English firm wishes to purchase large quantity of new and good second-hand screwed and socketted Tubes, sizes 2" to 6". Also Weldless Loose Flanged Tubes. Write "Tubes" c/o Taylors, 30 Fleet Street, London, England.
4-5

ONTARIO

Notice to Contractors

Tenders will be received by the undersigned up till noon on

Monday the 12th day of February, 1923,

for

1. The construction of an embankment across that part of the St. Mary's River lying between Broken Section O of the Township of Laird, District of Algoma and Pine Island, and
2. The Construction of re-inforced concrete launch opening in the said embankment.

The site of the proposed work is approximately eleven miles south of the Village of Echo Bay.

Plans and specifications may be seen and forms of tender obtained at the offices of this Branch situated at Sault Ste Marie and Gore Bay or at the office of the undersigned.

A marked cheque for ten per cent (10%) of the amount of the contract must accompany each tender.

Contracts for the embankment and launch opening may be awarded separately or together, but tenders must be submitted separately.

The lowest or any tender not necessarily accepted.

C. H. FULLERTON,
Director,
Northern Development Branch,
Parliament Buildings,
Toronto, Ont.
22nd of January, 1923. 5-6

A Service to the Profession

Every man wishing to tender must first see the plans and specifications.

If the plans are in Montreal and he is in Vancouver the inspection is a problem. We, however, with your assistance, are able to solve it. Place them on file at any or all of the offices of the "Contract Record" throughout the Dominion.

Contractors, engineers and allied manufacturers read the "Contract Record." It is the logical publicity medium for the announcement of tenders wanted.

Send us your plans. They will receive the best of care.

A room is reserved in each of our offices for examination of your plans by possible bidders.

Contract Record
and Engineering Review

Toronto - - - 345 Adelaide St., W.
Montreal - - 119 Board of Trade Bldg.
Winnipeg - - - 302 Travellers' Bdg.
Vancouver - - - 106 Winch Bldg.

Timber for Sale

About 250 pieces mostly red pine and spruce 50′ long, 5″ to 8″ at top end, suitable for piles. For further information write, Wm. Miller, Municipal Clerk, Pakenham, Ontario. 5

BUILDING MATERIALS, contractors and mill supply agencies wanted for St. Maurice Valley district by two engineers well connected and starting up sales business. Apply P.O. Box 84, Three Rivers, Que. 5

TENDERS

Water Filtration System

Town of Whitby

Tenders will be received by the Public Utility Commission of the Town of Whitby, up to 3.00 P.M. **Thursday, February 22nd, 1923**, for the various parts of the work and materials required in the construction of a system of Slow Sand Filters for the Town.

Contract "A" Construction of concrete filters including excavation, cement steel, concrete and pipelaying.
Contract "B" Supply of Cast Iron Pipe and specials.
Contract "C" Supply of Gate Valves, Foot Valves, Valve Boxes, etc.
Contract "D" Supply of Tile Pipe and Junctions.
Contract "E" Centrifugal Pumps, Motors, Gasoline Engine, etc.

Full particulars may be obtained from the Engineers.

W. J. LUKE, Chairman,
Public Utility Commission,
Whitby, Ont.

GEO. W. P. EVERY, Secretary,
Public Utility Commission,
Whitby, Ont.

F. W. THOROLD CO. LIMITED,
Consulting Engineers,
54 Admiral Road, Toronto.
Phone Hillcrest 5545

5-6

ANNOUNCEMENT

Philip C. Palin, Architect, of Collingwood, Ontario, wishes to announce that he has opened an office at Room 27, 18 Toronto Street, Toronto, where he will continue the practice of Architecture. Will be pleased to receive circulars and catalogues on building supplies. 5

WANTED IMMEDIATELY—for South America, two reliable operators for small revolving steam shovel. One year's contract on attractive terms to right men. Box 118, Contract Record, Toronto. 5

Port Arthur is contemplated. General manager, F. W. Riddell; Howie & Co. Ltd., Port Arthur, architects.

Stratford, Ont.

Tenders are being submitted on a $28,000 factory for Stratford Frames & Novelties Ltd. by Anglin Norcross Ltd., Toronto, J. L. Youngs, Stratford, A. Marson, Stratford, R. Gatehouse, Crown Investment Co., Richmond St., architect.

Threee Rivers, Ont.

J. A. Grenier, St. Angele, is excavating for an ice storage plant to cost $4,000. Work will be done by day labor.

Toronto, Ont.

Alterations will be made in March to a store at Bloor and Bathurst Sts. by the Loblaw's Groceteria Co. Mr. Shields is the building superintendent for the company.

Stores and apartments are contemplated by T. McCauley, Dearbourne Ave. Work will go ahead this spring.

Tenders for plumbing and heating $40,000 factory for O. Spanner & Co. will be called for next month by W. G. Hunt, Confederation Life Bldg., architect.

Crighton's Ltd., Peter St., will shortly commence on alterations to a building for a warehouse. Cost will be about $6,000.

Contracts for heating, painting, plastering, wiring and plumbing on $30,000 factory for Lawrence & Doughty, Church St., will be let shortly. H. Walker, Langley Ave., is the general contractor.

Tenders will be called for about Feb. 10 for an addition to the plant of Cutten & Foster, Church St. W. F. Sparling & Co., University Ave., architects.

H. B. Johnstone & Co., Dundas St., intend rebuilding their plant, recently destroyed by fire.

Thomas Palmer, Pacific Ave., is excavating for a factory on Plymouth Ave. Electrical, plastering, painting, plumbing and heating contracts to be let.

City Dairy Co. Ltd., Spadina Cres., are having plans prepared by Gore, Nasmith & Storrie, Confederation Life Bldg., for a garage. Tenders will be called about April 1.

About Feb. 1 tenders will be called for on 3 stores and 12 apartments for A. Poyntz, St. Clair Ave. W. G. Hunt, Confederation Life Bldg., architect.

Windsor, Ont.

N. Cherniak, Sandwich St. E., is excavating for stores and flats to cost $15,000. Nichols and Shepherd, Dowler St., architects.

Winnipeg, Man.

Plans are being prepared for a garage for W. H. McMillan, by J. D. Atcheson & Co., Boyd Bldg. Architects will call for tenders.

CONTRACTS AWARDED

Ford City, Ont.

Contracts have been awarded as follows on the $1,500,000 machine shops of Ford Motor Co.: Roofing, sheet metal and fire doors, A. W. Carmichael & Co., Walkerville; plastering, Troup Bros., Walkerville; painting, F. G. Roberts & Co. Ltd., Toronto; glazing, C. M. Bennett, Walkerville; metal sash and reinforced steel, Trussed Concrete Co., Walkerville; terazzo and tile, Kent Garvin & Co., Hamilton.

Hamilton, Ont.

The general contract for alterations to stores and offices for C. V. Langs, Merchants Bank, has been awarded to Mr. Mackay, St. Eloi Apts. Geo. Evans, Clyde Block, architect.

Montreal, Que.

W. S. D. Cook, Cathcart St., who has the general contract for the alterations to C. P. R. express building has awarded contracts as follows: Sheet metal & roofing, Douglas Bros. Co. Ltd.; plastering, R. D. Clarke & Sons; painting, E. Mapes.

John Dion, Aherst St., has awarded J. Vezina, Beaudry St., the contract for rebuilding a store at $8,000.

M. Singer, Cadieux St., has the roofing contract and E. Goldhurst the electrical contract for a dairy and flats costing $10,000.

Oakville, Ont.

Contracts on a $10,000 printing plant at Oakville have been awarded to: F. Sullivan, electrical; S. Pallet, plumbing; W. Covon, painting.

St. Catharines, Ont.

Electrical contract for two stores awarded to H. C. Holmes, Ann St.;

plastering contract to Dorkers & Swan, Louisa St.; owner, Bedrosian Bros., Ontario St.

Three Rivers, Que.

The general contract for a $210,000 extension to the Wabasso Cotton Co's. mill awarded to Foundation Co. Ltd., Montreal. Work will commence in about three weeks.

Toronto, Ont.

E. Lankin & Son, Lippincott St., are roofing the Holden Building on Adelaide St.

Dominion Bridge Co. has the contract for steel in the Harris Abattoir Co's. addition to their plant. Roofing, sheet metal and sheet metal windows contracts awarded to Douglas Bros. Adelaide St. W. Excavating being done by Lioni & Co.

R. G. Kirby, Yonge St., has the general contract for an ice storage plant for the Lake Simcoe Co. at cost of $12,000. F. S. Mallory, Bay St., architect.

Work will commence at once on a garage for Hale Motors, Vaughan Rd. Walter Davidson, Duke St., has the general contract.

Fiddes & Hogarth have the plumbing contract and Geo. Oakley & Son, the contract for marble for the $25,000 alterations being made to the Royal Bank at Bloor and Yonge Sts. Dickie & Co. are handling the general contract.

Jas. Spence, Front St., has the roofing contract for $10,000 storage warehouse for Toronto Motor Car Co., Toronto.

E .J. Curry, Toronto, has the plastering contract for the physicians building on Bloor St. costing $200,000.

Winnipeg, Man.

E. L. Faffer, Main St., has the general contract for repairs to stores for the Dominion Ticket & Financial Corp'n, Ltd., at a cost of $4,500.

Residences

Cap de Madeleine, Que.

Alfred Lesage, Three Rivers, contemplates a $5,000 cottage.

Cartierville, Que.

Tenders on flats to cost $30,000 for Dr. R. Goyer, Bordeaux, Que., will be called for in April. T. Daoust, Montreal, architect.

Charlottetown, P. E. I.

Salvation Army is building a residence costing from $3,000—$4,000. Mr. Higdon, Commandant.

Balance of the work on a $10,000 residence for Mrs. J. Richards, Bideford, will go ahead in the spring. No sub trades let. C. B. Chappell & Hunter, architects.

J. F. Macdonald, Ritz Apartments, is having Harris & Horton, Des Brisay Bldg., prepare plans for a $4,000 residence.

Concord, Ont.

Eighteen residences are contemplated by Miller & Sons, Luader Ave., Toronto. Plans drawn by D. Burnham, Toronto, and work will commence about Apr. 1. Fred. Miller, superintendent.

Belleville, Ont.

About the first week in April Mr. Windover will proceed with the work on a $4,000 residence.

Bronte, Ont.

Wm. Sargant will call for tenders in the spring for a $5,000 residence.

Hamilton, Ont.

Cartridge & Steer have commenced work on two bungalows costing $9,000.

London, Ont.

S. Jones, Tecumseh Ave., is having plans prepared for a residence to cost about $4,500.

$6,000 residence contemplated by F. H. Hindmarsh, St. James St., who is having plans prepared.

London Twp., Ont.

Plans are being prepared for a $20,000 residence. Chas. White, Dundas St., London, owner; W. G. Murray, London, architect.

Montreal, Que.

In March or April A. Gravel, Wiseman Ave., will call for tenders on a 3 flat residence.

Plans for a $50,000 apartment house are being prepared by Cajetan Dufort, St. Catherine St. Tenders will be called for in May.

Ottawa, Ont.

Altering residences into six flats is contemplated by W. Arnold, Nelson St. Cost will be about $12,000.

G. A. Colouhoun, Hopewell St., has had plans drawn for a $5,500 residence and intends to commence construction some time in April.

An $8,000 residence is contemplated by W. Douglas, Daly Ave.

Outremont, Que.

Tenders are wanted at once on tiling for a pair of semi-detached residences costing $30,000. F. Gray, Tunper St., general contractor.

Point Grey, B. C.

M. Johnisser, Vancouver, contemplates a residence costing about $5,000. Architect and general contractor, J. S. Hunger, Vancouver, B. C.

St. Catharines, Ont.

F. E. Hetherington, Ontario St., is having plans prepared for a residence to cost $10,000.

Lorne Baldwin, Willowdale Ave., will have plans prepared for several residences to cost $3,000 each.

Plans are being prepared for 10 residences costing $25,000. A. Gogo, Facer St., owner.

St. Mary's, Ont.

Work is in progress on seven of the ten residences proposed by Dr. Coupland at a cost of $4,000 each. As soon as the frost is out of the ground work will start on the other three.

Sandwich, Ont.

J. H. Jewell, Louis Ave., is excavating for a Duplex residence to cost $14,000.

Foundations are in for a duplex residence costing $14,000. J. H. Jewell, owner.

Saskatoon, Sask.

J. H. Cameron, 12th St., contemplates an apartment house to cost $7,000.

Souris, P. E. I.

Plans are being prepared for a $10,000 residence for J. C. McLean. C. B. Chappell & Hunter, Charlottetown, architects.

Strathroy, Ont.

Wesley Hambly, Strathroy, is having plans prepared for a residence. Price wanted on all material.

Surrey, B. C.

Residence costing $3,500 is contemplated by James Peterson, Bergstron Rd.

Three Rivers, Que.

L. Dore, St. Cecile St., is excavating for a residence to cost $6,000.

Toronto, Ont.

Tenders are being received for roofing, wiring, painting, plastering, plumbing and heating contracts for three six family apartments costing $35,000 each, being built by J. Henderson, St. Clair Ave.

W. F. Devine, Northcliffe Blvd., has commenced work on a pair of residences costing $6,000.

About March 1 G. H. Brown, Roach Ave., will commence work on a residence costing $7,500.

D. C. Kay, Kent Building, is excavating for two pair of semi-detached residences costing $10,000.

J. Richichi, Chisholm Ave., is excavating for a residence to cost $5,000.

P. Wyatt, Dagmar Ave., is building two residences costing $6,000 each.

Residence costing $5,500 contemplated by Mrs. C. M. Hall, Manning Ave.

Dr. R. S. Richardson, Mountview Ave., contemplates a residence costing $12,000. Contracts to be let for painting, plastering, heating, wiring and plumbing.

Tenders are wanted for a two family residence to cost $15,000 by J. Weston, Gormley Ave. Work will start in April.

C. Best, Hastings Ave., wants tenders on a pair of residences costing $7,000.

R. T. Walker, Eglinton Ave., has excavated for two residences costing $4,500.

Foundations are going in for a $6,000 residence for J. A. McFarlane, Sherwood Ave.

New tenders are wanted and will be accepted until Feb. 3 for a residence in Roxboro Drive. E. L. Ruddy, Spadina Ave., owner. C. S. Cobb, Bay St., architect.

Two residences costing $6,000 each being built by C. McCabe, Kendal Ave. J. Shire, Graham Rd., is the general contractor.

T. G. Henthorn, Roselawn Ave., is excavating for a residence costing $9,000 to be completed by April 15.

J. Johnstone, Erskine Ave., has excavated for a residence costing $7,000 and will proceed with work about Mar. 15.

Four detached residences costing $6,000 each are contemplated by T. Padfield, Chisholm Ave. No material purchased.

Chas. L. Gray, Hillsdale Ave., contemplates a residence at a cost of $4,500.

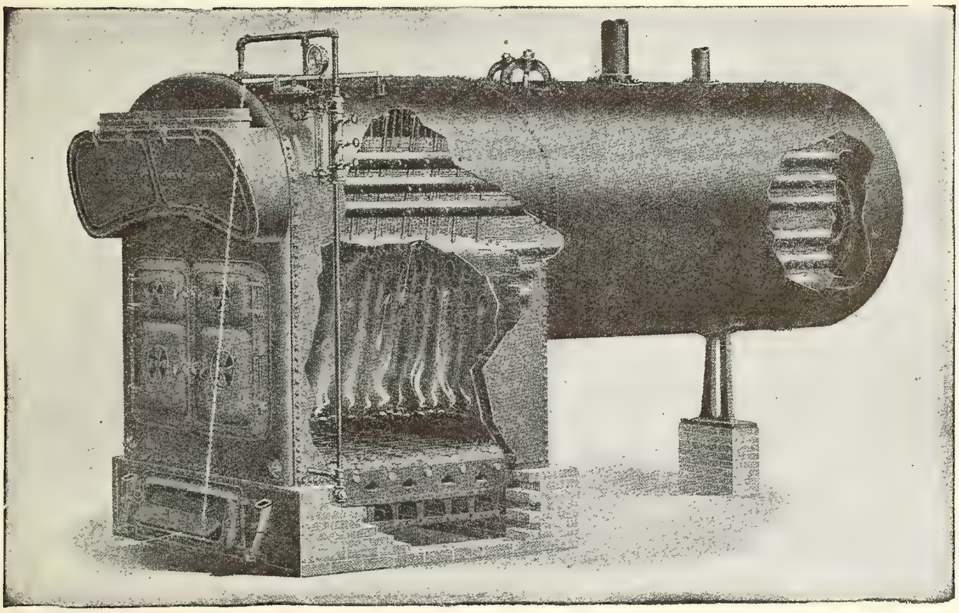
J. O White, Eglinton Ave., is building a residence costing $5,000.

Tenders will be called for in the spring on all trades by H. L. Kennedy, Northcliffe Blvd., on a pair of residences costing $7,000.

Tenders are being received by W. H. Snell, Deloraine Ave., on plastering, heating, painting, wiring and plumbing for a residence costing $6,000.

E. Holt, Bansley Ave., will let tenders

THE JOHN INGLIS CO.
LIMITED
ENGINEERS AND BOILERMAKERS
ESTABLISHED 1860



BOILERS Of all types built to suit requirements.

TANKS, Stacks, Water Towers, and all classes of Steel Platework.

Engines and Pumps Marine, Corliss and Pumping Engines; Centrifugal Pumps, and all classes of Special Machinery.

First class workmanship—Best quality of materials—Prompt delivery
Write us for Prices, Catalogues, etc.

Office and Works—14 Strachan Avenue, TORONTO, Canada

on plastering, heating, painting, wiring and plumbing for 4 pair of residences costing $5,000 a pair.

Work will start in the spring on a $7,000 residence, E. G. Warren, Summerhill Ave., owner and builder. No material purchased.

T. H. Cotton, DeGrassi St., contemplates a $6,000 bungalow this spring. No materials purchased.

J. B. Johnston, Queen St. E., contemplates one residence and a pair of residences costing $12,000.

Lester, Crone & McMillan, Danforth Ave., are receiving tenders on heating, plastering, plumbing, painting and electrical work for a $4,000 house.

A pair of residences costing $8,000 are being built by J. Carr, Oakdene Cres.

A. Geddes, Danforth Ave., will build an $8,000 residence in the spring.

Merrill System, Queen St. E., is having plans prepared for the 3rd unit of an apartment house. W. G. Hunt, Confederation Life Building, architect.

Residence costing $6,000 contemplated by T. H. Martin, Fulton Ave.

Two residences costing $4,500 each are being built by T. Walker, Eglinton Ave.

J. McClure, Roehampton Ave., contemplates two residences in the spring. Interested in a suitable site.

Frank Sharp, 1452½ Bloor St. W., contemplates building several residences this spring.

Thos. McGowan, North Place, contemplates two pair of residences this spring.

Chas. P. Band, Woodlawn Ave., is preparing plans for an addition to a residence.

Walls are going up for a residence costing $6,000 on St. Germain St. F. Williams, St. Germain St., is the owner and builder.

McIlroy & Lowry, Kennedy Ave., have secured the sites for seven residences.

Residences are contemplated in the Runnymede district by C. J. Mountjoy, Runnymede Rd.

J. J. McKinney, Dundas St. W., has secured the sites and in the spring will build several residences in the east end.

Several residences in Runnymede are contemplated by T. H. Huff & Son, Willard Ave., this spring.

McKinley & Baird, Bloor St. W., have secured sites for several residences in the North Yonge St. district.

J. Meldrum, Windermere Ave., may commence work about Mar. 1 on several residences in Runnymede.

W. H. Glen, Bird Ave., proposes to build a residence in the St. Clair district at a cost of $7,000.

Vancouver, B. C.

Residence costing $7,500 will be built by T. H. Archdeacon, Point Grey Rd. C. B. Fowler, architect.

Verdun, Que.

Duranceau & Duranceau, Hamilton St., will start work shortly on flats to cost $60,000. F. L. Beique, Sherbrooke

Walkerville, Ont.

Plans are being prepared for a $14,000 residence by Pennington & Boyde, Windsor, for Rev. Father J. B. Neville, Monmouth Rd. Tenders on all subtrades will be called by the architect about Feb. 1.

Windsor, Ont.

W. G. Frederick, Elm Ave., will build a residence costing $3,500.

Octave Carmichael, Ford, is excavating for a residence to cost $4,000.
St., owner.

CONTRACTS AWARDED

Montreal, Que.

Contracts have been awarded as follows on two residences costing $16,000, being built by L. O. Jalbert, Chambly St.: Brick, Fred Savard, Aylin St.; roofing, T. X. Guay, Culliver St.; electrical, M. Deschenes, c/o general contractor; plumbing, Chouinard & Otis, Valois St.; plastering, T. Desbiens, Orleans St.; sash and doors, Victor Varin, Moreau St.

The electrical contract for a $60,000 apartment house being built by W. Hanfield, Place D'Armes, was awarded to A. L. Allard, Mount Royal Ave.

Contracts on a residence and garage costing $22,000 have been let as follows: Brick, T. X. Robillard & Co.; roofing, M. Desjardins; electrical, O. Tardiff; plumbing, E. Tremblay; plastering, E. Tessier. C. Gariepy, Se. Clements St., is the owner.

G. Shearington, Park Ave. Extn., has the electrical contract for a $15,000 residence.

Contracts on two residences costing $18,000 have been awarded by L. & S. Besner, Christophe Colombe St., as follows: Brick, A. Tranchemontagne; electrical, R. Goulet; plumbing and heating, M. Lemieux; sash and doors, Pigeon & Drapeau; painting and plastering by day labor.

E. Desjardins, has let contracts on a $9,000 residence as follows: Roofing, M. Hamelin; electrical, R. Goulet; plumbing, Corbeil & Doucet; sash and doors, Millen & Freres.

Phoenix Bridge & Iron Works Ltd. has the contract for steel and C. Malchelosse is installing the plumbing in a $9,600 residence being built by P. Maurice, Harvard St., for C. Noiseux.

S. Marotta, St. Catherine St., has been awarded the general contract for alterations to J. O. Lesieur's residence at a cost of $14,000.

Roofing contract for four stores and seven apartments has been awarded to Dominion Sheet Metal Works, Laval St., and the plumbing contract to Lavigueur and Menard, St. Lawrence St. J. Dominique, Sheerbrooke St., owner. Balance of trades not let.

Montreal West, Que.

Roofing contract for $12,000 residence awarded to A Bennett and electrical contract to G. R. Gregory. Thos. Gray, Tupper St., has the general contract.

Oakville, Ont.

Plumbing and heating contracts on a residence costing $6,000 awarded to W. Newell. Harry Husband has the plastering contract. Geo. Fish is the owner.

Outremont, Que.

On 32 suites of apartments costing $200,000 being built by Dr. Belanger and L. Berna, the following contracts have been awarded: Electrical, J. A. Roy; brickwork, B. Carra; tiling, Paul Capra; Seaman-Kent Co. Ltd., supplied the flooring.

Toronto, Ont.

Plastering contract for three pair of residences has been awarded to Clark, Wood & Pratt, Bleeker St.

The wiring contract for a $12,000 residence has been awarded M. Nealon, Glen Morris St., by J. M. Cowan, architect.

H. J. Beard has the plumbing contract for a $14,000 bungalow and Toronto Furnace Co. has the heating contract. F. E. Taylor, Gerrard St. E., is the owner.

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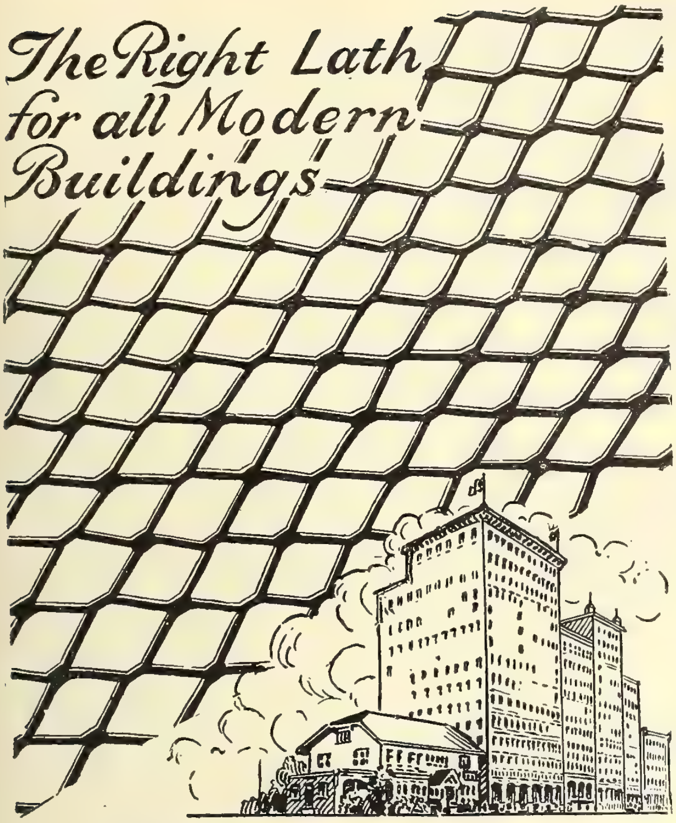
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Loan for Palestine

The Palestine Government has arranged for a loan of £2,500,000 floated in London. Pending conclusion of arrangements for the loan, the Crown agents in England advanced considerable sums at various times, thus £1,250,000 already has been spent. With the exception of £50,000, assigned as a loan to trans-Jordania, and £300,000 to be used for the purchase from French owners of the Jerusalem-Jaffa Railway, this money will be used for public works.

The Government long had a definite public works programme in mind, but was prevented from carrying it out because of constant money stringency. This had also caused the suspension of road building and repairing, producing an unemployment problem among Zionist pioneers which only the house-building activity helped to solve.

Battleship Contracts

Lord MacLay, former shipping controller in a speech at Glasgow told the people a few home truths. He said that Clyde shipbuilding firms had lost the contract on one of the two new battleships which the Government had ordered because of the large difference in the estimates between the Clyde firms and those of the Tyne and Mersey, and it had become impossible for the Government to place the order on the Clyde because, compared with the other shipbuilding districts, there was inefficiency on the part of the Clyde workmen.

He said that this was equivalent to ten per cent less output from the Clyde shipbuilding yards than from the others.

Lord MacLay said he hoped that the people on the Clyde River would pay heed to his words and that such a sad reflection on them would be wiped out.

Dredging the Lower Detroit

Contracts have just been let by the United States Government for channel construction in the lower Detroit River aggregating over $1,000,000. Lowest bids were made by the M. Sullivan Dredging Company and the Dunbar & Sullivan Company, whose bids were exactly the same and the contract will be divided.

The contract, which is one of the largest dredging contracts let in this part of the country for the past 15 years, extends three miles and runs parallel and adjacent to the new Livingstone Channel recently constructed. A 300-foot channel was first made for down-bound boats, and an 800-foot channel will eventually be built. It is thought that it will then be used for freighters bound either up or down.

Expect Pre-Cooling Plant

It is practically assured that Chilliwack, B. C. is to have a pre-cooling plant erected in time to handle the 1923 berry crop. A plant that will take care of the fruit shipments of the entire district will involve an expenditure of some $10,000 for the first unit of the building and equipment.

Following the recent purchase by the executive of the Fraser Valley Farmers' Co-operative Association of two lots adjoining the association's present warehouse for $500 it was decided at the annual meeting of the association to erect a new warehouse on these lots.

·BULLETIN·No 6·

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THEN ALL YOU REQUIRE TO SAY IN YOUR SPECIFICATIONS IS:—

"CONFORMING TO THE REQUIREMENTS OF THE A.S.T.M. SPECIFICATION A16-14."

THE AMERICAN SOCIETY FOR TESTING MATERIALS IN 1913, AFTER SIX MONTHS MOST EXHAUSTIVE RESEARCH, WROTE THE FOLLOWING STANDARD SPECIFICATION, GIVING IT THE SERIAL DESIGNATION A16-14.

RAIL—STEEL CONCRETE REINFORCEMENT BARS

SERIAL DESIGNATION A16-14.

4 (a)—THE BARS SHALL CONFORM TO THE FOLLOWING MINIMUM REQUIREMENTS AS TO TENSILE PROPERTIES:

PROPERTIES CONSIDERED	PLAIN BARS	DEFORMED & HOT TWISTED BARS.
Tensile strength, lb. per sq. in.	80,000	80,000
Yield point, lb. per sq. in.	50,000	50,000
Elongation in 8 in., per cent.	$\frac{1,200,000}{\text{Tens. str.}}$	$\frac{1,000,000}{\text{Tens. str.}}$

6-THE TEST SPECIMEN SHALL BEND COLD AROUND A PIN WITHOUT CRACKING ON THE OUTSIDE OF THE BENT PORTION AS FOLLOWS:

THICKNESS OR DIAMETER OF BARS	PLAIN BARS	DEFORMED & HOT TWISTED BARS
Under 3/4 in.	180 deg d = 3t	180 deg d = 4t
3/4 in. or over	90 deg d = 3t	90 deg d = 4t

NOTE:- d = The diameter of pin about which the specimen is bent.
t = The thickness or diameter of specimen.

LET US SEND YOU A COPY OF THE COMPLETE SPECIFICATION.

Current Prices of Building and Engineering Materials

CEMENT (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Retail lots including bags	per bbl.	$4.60	$4.40	$4.80	$3.70
Car lots, including bags	per bbl.	3.35	3.68	4.16	3.35
Refund on bags	each	.20	.20	.20	

LIME (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Lump, in retail lots	per ton	14.30	14.00	.58 bu.	2.70 bbl
Lump, in car lots	per ton	12.70**	11.00	13.80 ton*	2.60 bbl
Hydrated, in retail lots	per ton	20.00	26.00	.60 bag*	30.00
Hydrated, in car lots	per ton	19.00	21.00	.54 bag*†	25.00

BRICK and TILE (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Common face brick	per M.	24.00	16.00*	19.00	30.00
No. 1 dry pressed brick	per M.	31.00	30.00	36.00	70.00
No. 2 dry pressed brick	per M.	29.00	25.00	32.00	
Enamelled brick	per M.	125 up to	230.00	185.00	150.00
Wire cut brick, for foundation work	per M.	21.00	19.00		50.00
Sand lime brick	per M.	17.00		18.00	
Hollow building tile	per M.			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	60-95	60-75	85-100	80.00
Fire clay	per ton	13-20	15-16.00	35.00**	22.00

STONE, SAND and GRAVEL (f.o.b. cars on siding):—		Toronto	Montreal	Winnipeg	Vancouver
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.00 yd
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 "	" "
Crusher run	per ton	2.20½		3.00 "	" "
Rubble stone	per ton	2.45	1.70	15.00 cord	" "
Gravel, 2 in. screened	per ton	2.05		2.45 yd.	" "
Gravel 1 in. screened	per ton	2.31	1.50	2.75 "	" "
Sand, screened	per ton	1.42½	1.25	1.90 "	" "
Pit run	per ton	1.52¾	1.25	1.90 "	" "

STEEL and IRON (f.o.b. warehouse):—		Toronto	Montreal	Winnipeg	Vancouver
Mild steel bars, ¼ in. and heavier	per 100 lbs.	3.25 base	3.25 base	4.35	$4.00
Bands 3/16 in. and lighter	per 100 lbs.	3.75 "	3.25 "	4.85 base	
Hoops	per 100 lbs.	4.50 "	4.25 "		
Twisted and deformed bars	per 100 lbs.	3.35 "	3.25 "	4.20	4.00
Angles, channels and tees under 3 in.	per 100 lbs.	3.35 "	3.75 "	4.95	6.00
Structural shapes	per 100 lbs.	3.60 "	3.75 "	4.75	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.25 "	3.50 "	4.75	6.25
Plates—3/16 in.	per 100 lbs.	3.60 "	3.85 "	5.15	6.50
Plates—10 gauge	per 100 lbs.	4.15 "	4.00 "	5.45	6.50
Black sheets—28 gauge	per 100 lbs.	5.00 "	4.50 "	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.20 "	6.00 "	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	6.20 "	6.50 "	7.70	8.25-8.50
Rivets	per 100 lbs.	5.75 "	5.50 "	7.00 base	
Cast iron pipe	per ton	60.00	55.00		

VITRIFIED CLAY PRODUCTS (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Sewer pipe, 4 in.	per ft.	.40	.30	.35	.28
Sewer pipe, 6 in	per ft.	.60	.45	.45	.48
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.55
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.70
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.85
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2 45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00	.90	.65	.75
Chimney tops	each	9.00	3.50–5.00	7.50	4.50–6.00
Discounts		45 % truck lots	20 %		
		50 % car lots	50 %	5 %	

CEMENT:—*Discount of 10 cts. per bbl. in 20 days. Price f.o.b. cars is $3.75 †Subject to 5% discount. **Excluding bags.
LIME:—*Discount of 5%. †Bag of 50 lbs. **Price f.o.b. cars is $11.70.
BRICK AND TILE—*f.o.b. plant.
STONE SAND AND GRAVEL:—*Winnipeg prices subject to 5% disco **Toronto prices include sales tax.

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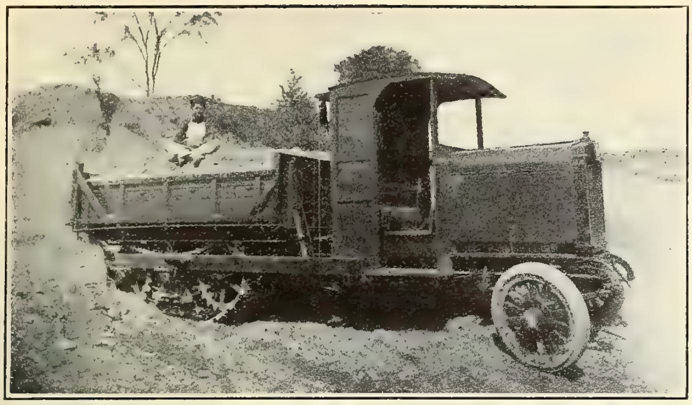
LINN TRACTOR

For Economical Hauling



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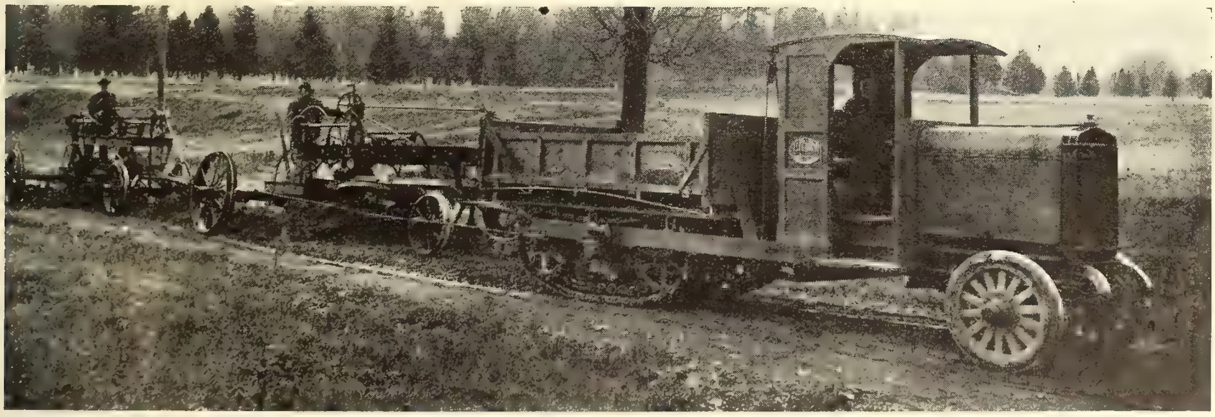
The Linn Tractor is a powerful machine for hauling. It has the added advantage of not only carrying a load on itself, but can, at the same time, haul trailers behind. It will carry a ten-ton load, yet the weight is so well distributed that the roadbed is not disturbed. It can be used on City Streets or Country Roads, and will go to places where ordinary wheel trucks could never reach. It can be used in winter by replacing the wheels with sleds, and the hauling capacity in winter is 50% greater. It will work in temperatures of 50 degrees below zero. It will pay big dividends on your investment. Write us for full information.

Linn Tractor Takes a Load from the Pit



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Lumber (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver*
Flooring, 1 x 3 and 4 in., clear, E. G. fir	per M.	100.00	60.00	84.00	55.00
Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	75.00	65.00	56.00	30.00
Flooring, No. 1 pine	per M.	70.00	80.00	64.80	
Flooring, No. 1 Spruce	per M.	45.00	40.00	39.60	
Flooring, birch and maple, 13/16 in. clear	per M.	130.00	110.00	152.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	130.00	125.00	140.00	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	75.00	60.00	56.00	30.00
V joint, No. 1 pine	per M.	70.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	43–58	45.00	63.75	
Pine, 2 x 4 to 12 in., common rough	per M.	50/55	70.00	36.00	
Hemlock, 2 x 4 to 12 in.	per M.	40-42.00	40.00	36.00	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	40–50.00	50.00	36.00	11.00-13.50
Spruce, 1 and 2 x 4 to 12 in.	per M.	41/46	45–35	36.00	
Timbers, fir, 10 x 10 in. and up	per M.	65.00	58.00	47.00 base	17.-22.00
Lath, No. 1 white pine	per M.	14.00	12.00	12.00	
Lath, M. R. spruce	per M.	10.00	8.50	10.00	7.00
Shingles, XXX B.C. cedar	per M.	6.35	5.00	5.25	3.40
XX B.C. cedar	per M.	5.00	4.25	3.75	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	108.00	55.00
Fir casing	per M.	1 ct. per in.	100.00	108.00	
PAINTS, OILS, COLOURS (delivered):—					
White lead ground in oil, less than ton lots	per cwt.	14.55	13.35	14.85	15.80
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	22.00
Putty in bulk	per cwt.	6.70	3.75	5.50	9.25
Steel sash putty in bulk	per cwt.	7.20	6.00	8.75	7.75
Boiled linseed oil, in bbls.	per gal.	1.15	1.04	1.13	1.28
Raw linseed oil, in bbls.	per gal.	1.18	1.02	1.10	1.25
Turpentine, in bbls.	per gal.	2.25	1.95	2.15	1.60
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 4/5	6.45 per cwt
Mortar Color, black, in bbls.	per lb.	.08		.06 1/5	.45
PLASTER (Delivered):—					
Hard wall plaster, sanded	per ton	13.50	15.00	25.00	30.00
Plaster of paris, in bbl. lots	per bbl.	6.00	5.35	1.60 bag*	7.50
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu.	1.50
LABOR:—					
Bricklayers	per hr.	1.00	.80–.90	1.15	1.06¼
Structural Iron Workers	per hr.	.85	.50–.75	1.25	1.00
Plasterers	per hr.	1.00	.80	1.05	1.06¼
Hoisting Engineers	per hr.	.70–.80	.50	.90–1.10	1.00
Plumbers	per hr.	.90	.60–.75	1.00	.90
Carpenters	per hr.	.80	.65	.90	.81¼
Painters	per hr.	.75	.55–.65	.80	.81¼
Electrical Workers	per hr.	.80	.65	.70– .90	1.00
Roofers	per hr.	.65	.65		.90
Laborers	per hr.	.40–.50	.30	47½–.55	.50–.56¼
Sheet Metal Workers	per hr.	.75			.90

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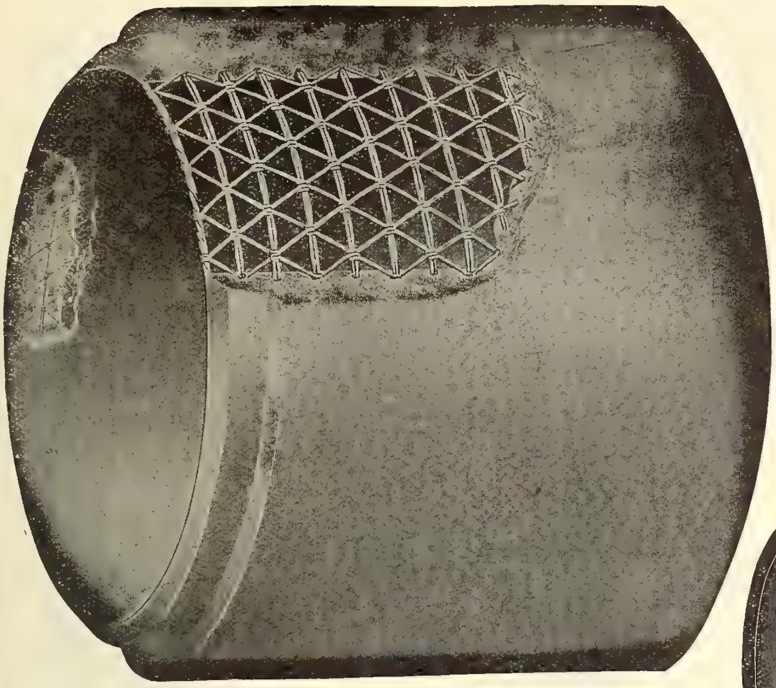

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give maximum service
at minimum cost
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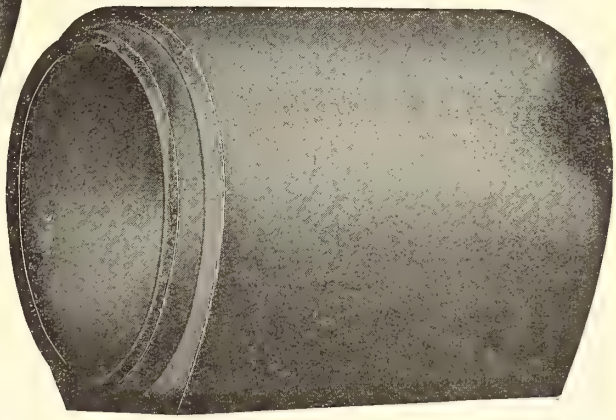

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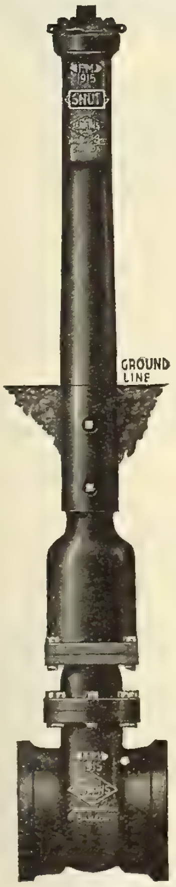

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RENFREW LIME

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Manufacturers: LIME, BRICK, FARM TILE.

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Elimination of unsatisfactory materials for interior lining has led to the universal adoption of Enameled Brick—BECAUSE for thirty years it has stood the most severe tests.

ENAMELED BRICK—Give the greatest amount of permanent Light reflection.

ENAMELED BRICK—Are impervious to Oils and Grease and can be cleaned with Soap and Water.

ENAMELED BRICK—Cannot be dislodged from place by vibration, thus eliminating all Maintenance charges.

ENAMELED BRICK—Can be used as a part of the bearing walls, cheapening the Cost of Construction.

ENAMELED BRICK—Can be supplied by us in White or Solid Colors and in Mottled effects.

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include bare and insulated, lead covered and armored conductors of all kinds and sizes and for all classes of service.

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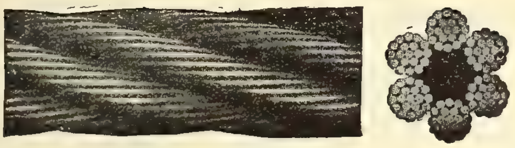

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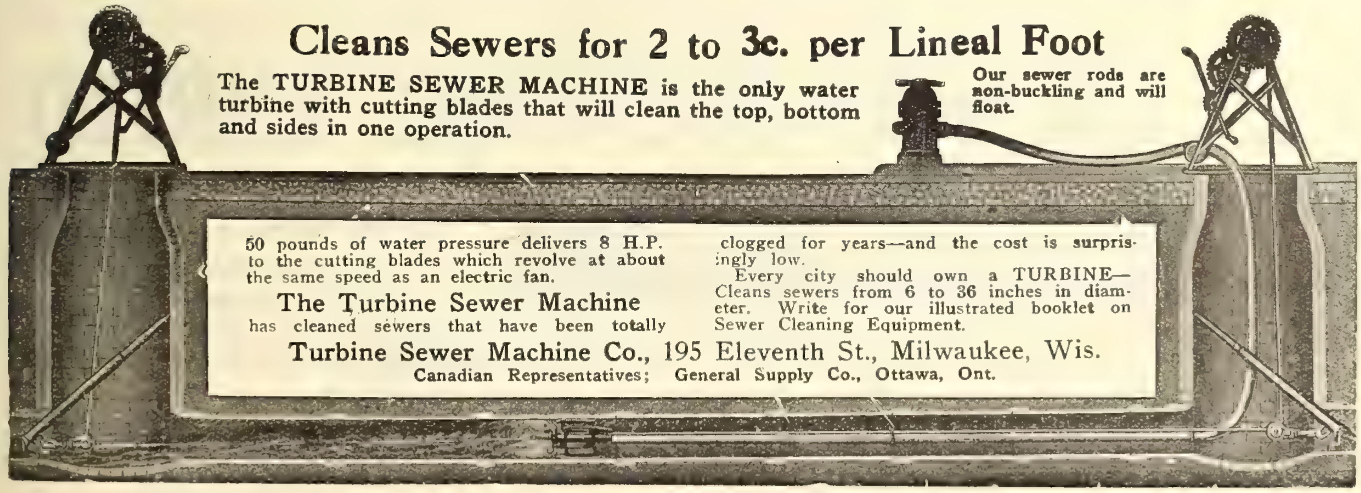

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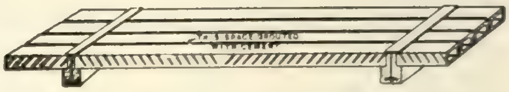

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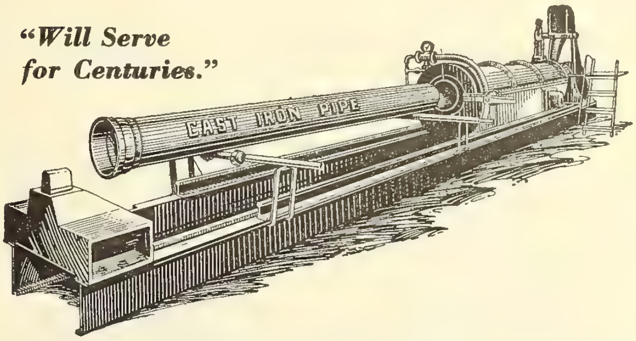

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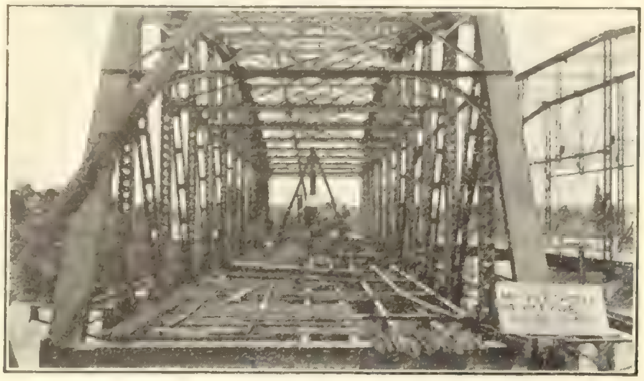

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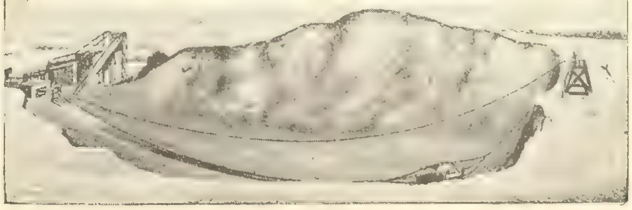

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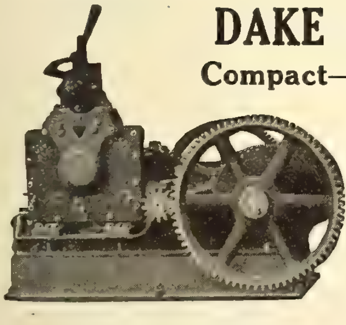

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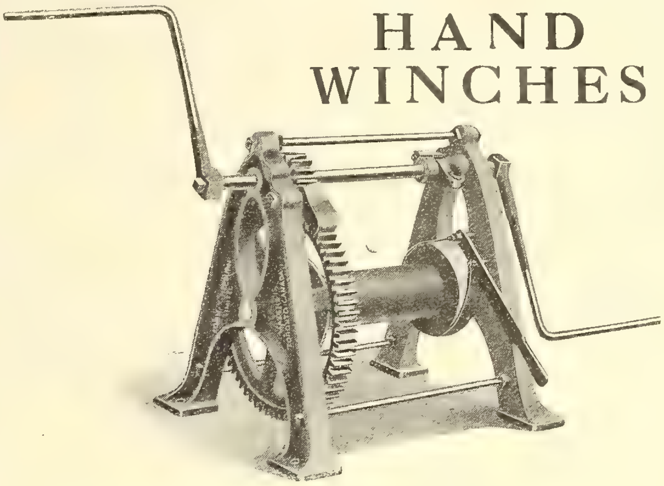

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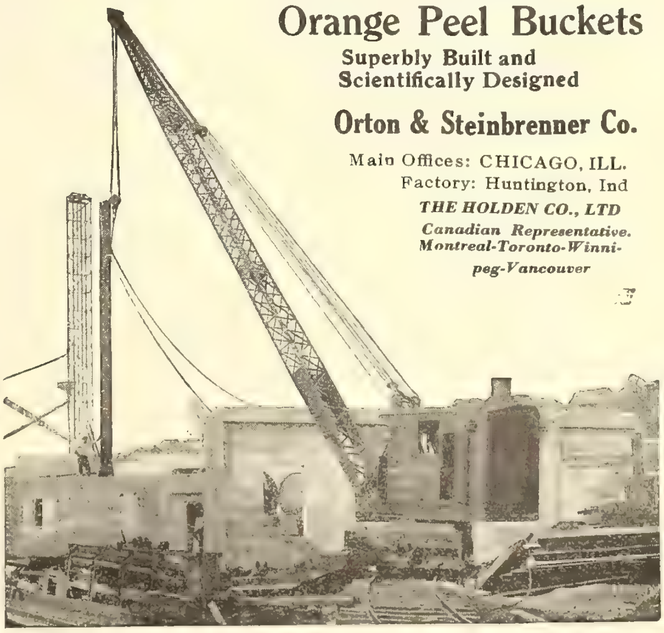

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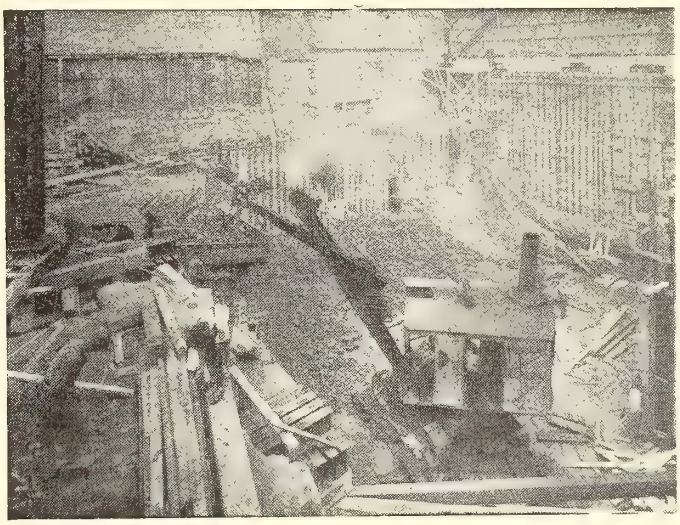

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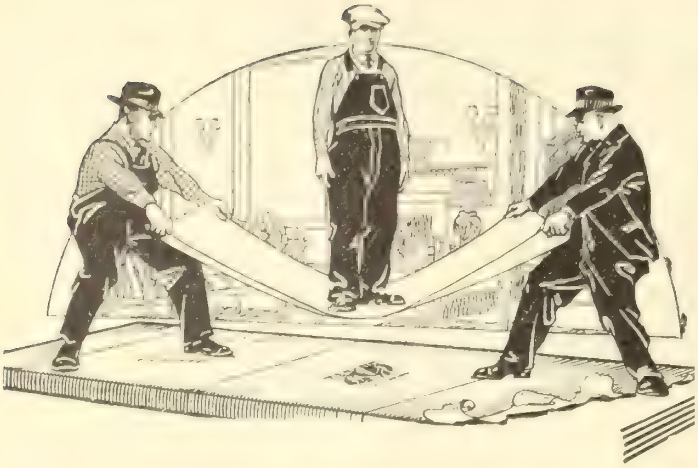

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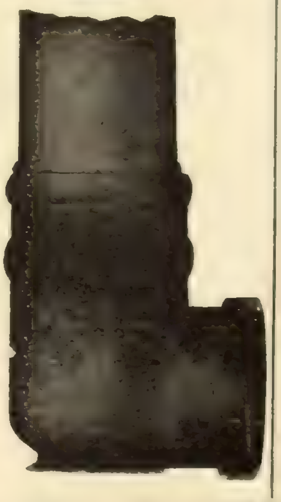

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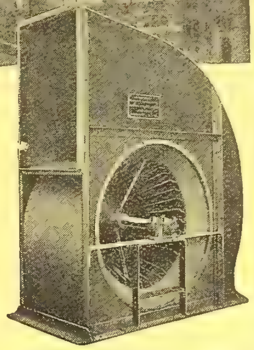

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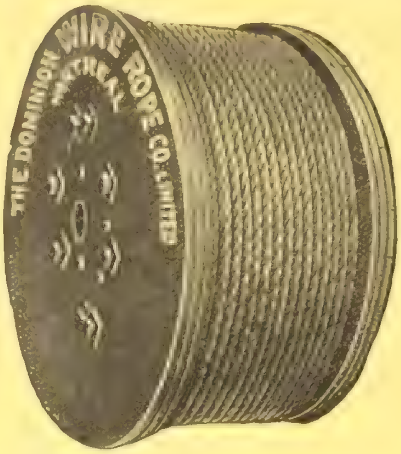

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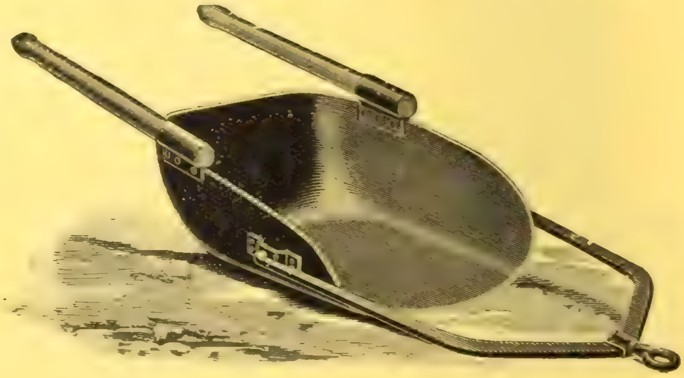

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Vol. 37 Toronto, February 7, 1923 No. 6

Contract Record and Engineering Review

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Laid Aug. 1922

"Black Base" in Brantford

Continuing a successful program of asphalt construction, Brantford in 1922 laid 17,585 square yards of asphalt pavement, of which 12,570 square yards were of 4" of "Black Base" with 1½" sheet asphalt wearing surface, laid over old gravel and macadam subgrades. The Black Base mixture utilized local materials to the fullest extent and consisted of 80% local gravel, 15% crushed stone and 5% asphalt cement. The work was done by day labor under the direction of F. P. Adams, A.M.E.I.C., City Engineer.

By salvaging these old roadways with this type of improvement, Brantford City officials saved their ratepayers thousands of dollars, yet gave them a first class pavement capable of carrying heavy traffic for many years.

Where old subgrades possess considerable supporting power, thin slabs of flexible black base successfully absorb the impact of heavy fast traffic and the combination provides a foundation which has all the characteristics of the ideal.

Over 15,000,000 square yards of Black Base are in existence on the American Continent today and some sections have been giving excellent service for many years. Many Canadian municipalities will find it to their decided advantage to fully investigate the possibilities and service records of Black Base pavements.

IMPERIAL
Asphalt PRODUCTS

Paving Asphalts
Asphalt Binders
Liquid Asphalts
Asphalt Cold Patch

ROAD ENGINEERING DEPARTMENT
Imperial Oil Limited
Toronto Canada

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A view of our 36" Continuous Stave

Wood Pipe

in the famous Capilano Pipe Line which, after serving Vancouver City faithfully for over 15 years, is still in its infancy.

C. S. Pipe is used successfully for hydro-electric purposes up to 14 ft. in diameter.

TANKS

and SILOS to Order
Any Size—Any Style

CONTINUOUS STAVE
Wood Pipe
or WIRE WOUND

YOU CAN NO LONGER RECKON WITHOUT WOOD PIPE

We have enthusiastic customers willing to assure you that recent improvements have so increased efficiency and durability as to place **Wood Pipe** on a plane with Cast Iron. These features at a low initial cost, combined with ease of transportation and installation, spell true **Economy.**

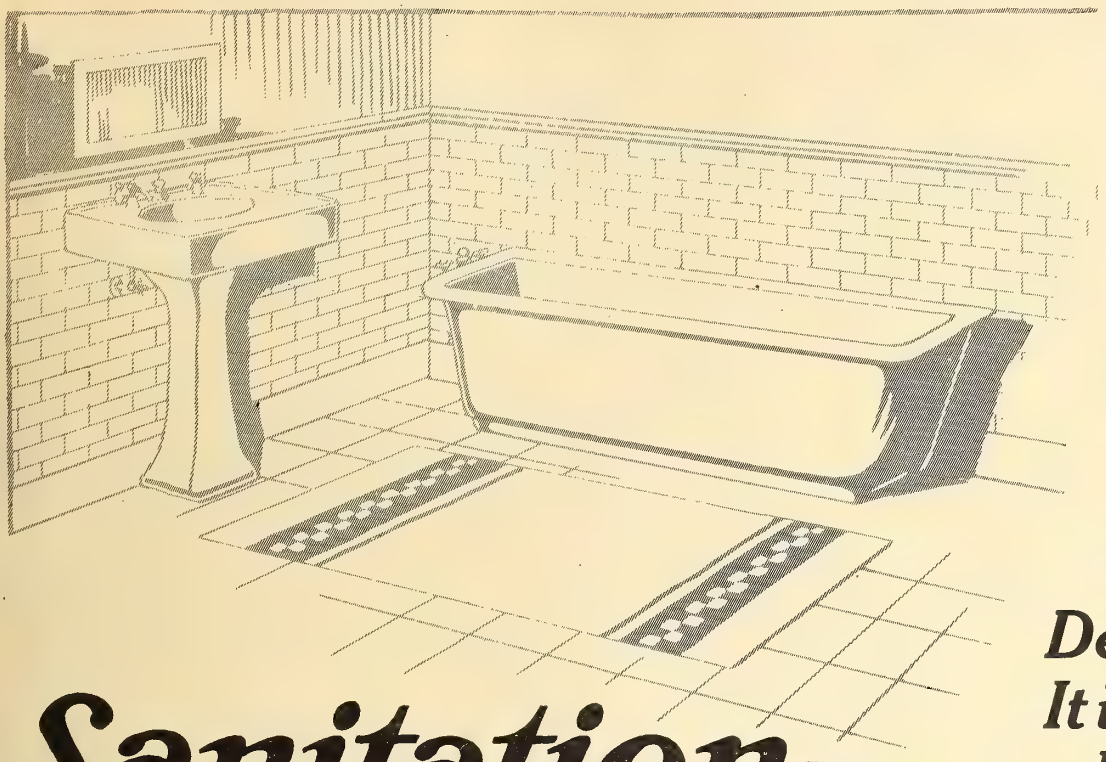
When writing for information and prices please specify diameter and pressure

Our Electric-Butt-Welded
STEEL
DOUBLE COUPLING
with Inside Ring
Galvanized

has entirely eliminated joint leaks and has perfected WIRE WOUND PIPE

Canadian Pipe Company, Ltd.

550 Pacific St., VANCOUVER, B. C.



Sanitation-

You Demand It in Your Home

Unsanitary conditions are not tolerated in Canadian homes yet the sewage systems that serve these homes are often in a deplorable state. Communities that are without sanitary works of any kind find themselves handicapped in the race for prosperity because they are sacrificing their chief claim to proper living conditions.

Every town in Canada should have an efficient sewage system serving every street. To obtain the greatest measure of success, leading engineers almost invariably choose Vitrified Clay Salt Glazed Sewer Pipes for they are guaranteed by an unbroken record of satisfactory service covering a period of seventy years and more.

The installation of this pipe ensures permanent, sanitary and efficient sewers from the house to the disposal works. Vitrified Clay Salt Glazed Sewer Pipes have been proven best in all the great cities of the world, and under all conditions. There is no suitable substitute.

For quotations and particulars, write to
Vitrified Clay Pipe Publicity Bureau
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St. Johns, P.Q. New Glasgow, N.S.

VITRIFIED CLAY PIPE

PERMANENT AS THE PYRAMIDS

This is how we're getting business for YOU, Mr. Dealer

"Day by day in every way business is getting better and better for the Gyproc Dealer."

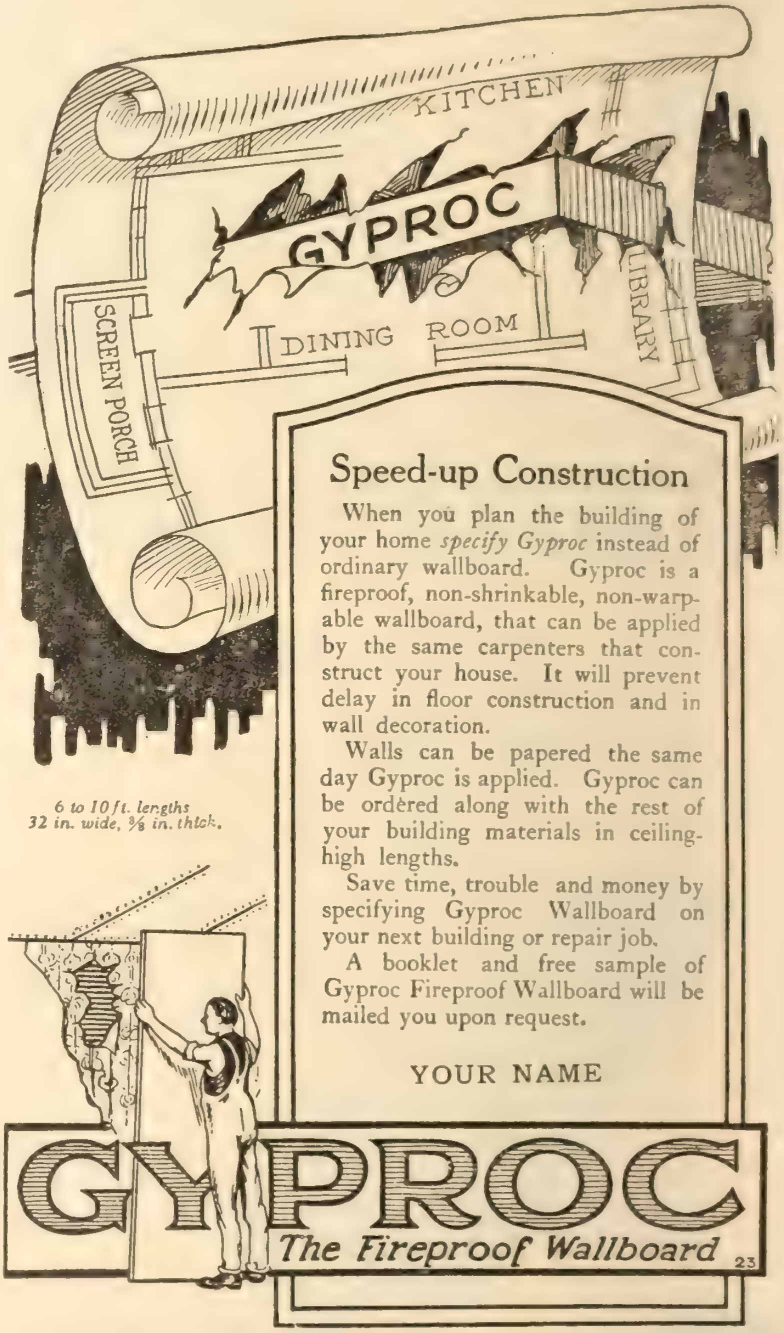
Every day throughout Canada, the daily newspapers carry the Gyproc message to thousands of home owners, builders and architects.

The accompanyiny advertisement is typical of the series now being used. It tells in a short and forceful way the advantages of this superior fireproof wallboard—Gyproc. It directs the customer into YOUR office, Mr. Dealer.

Are you prepared to handle the order?

Not only Gyproc but other Gypsum products—Gypsum Board, Gypsum Plaster and Gypsum Block—are engaging the attention of an ever-increasing number of people. They have realized the wisdom of building for permanence. They know the folly of "building to burn."

Now is the time to get busy and prepare for the opening of the building season. We'll furnish full particulars immediately upon receipt of your enquiry. Drop us a line today.



6 to 10 ft. lengths
32 in. wide, 3/8 in. thick.

Speed-up Construction

When you plan the building of your home *specify Gyproc* instead of ordinary wallboard. Gyproc is a fireproof, non-shrinkable, non-warpable wallboard, that can be applied by the same carpenters that construct your house. It will prevent delay in floor construction and in wall decoration.

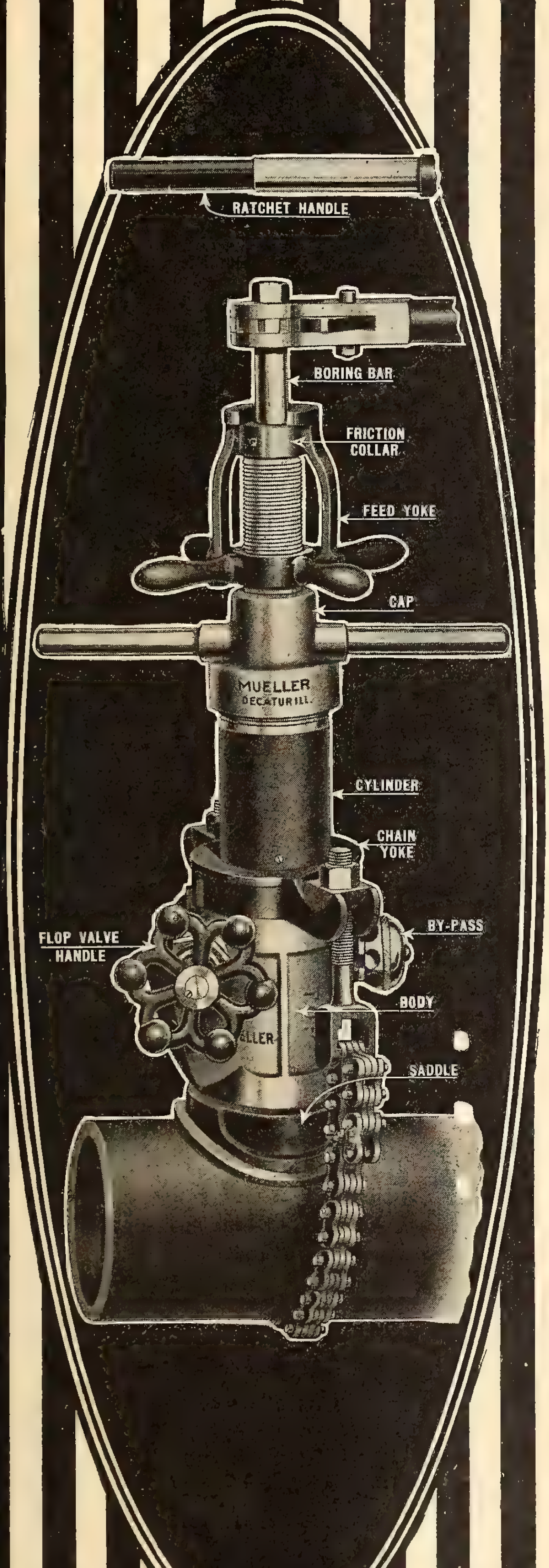
Walls can be papered the same day Gyproc is applied. Gyproc can be ordered along with the rest of your building materials in ceiling-high lengths.

Save time, trouble and money by specifying Gyproc Wallboard on your next building or repair job.

A booklet and free sample of Gyproc Fireproof Wallboard will be mailed you upon request.

YOUR NAME

THE ONTARIO GYPSUM COMPANY LIMITED
Head Office: PARIS, Ont.
Toronto Offices: 106 Don Esplanade Montreal: 374 Beaver Hall Sq.
Factories: Caledonia, Ont., Lythmore, Ont.



MUELLER
No. A
TAPPING MACHINE

illustrated, solves the problem of interrupting service. Simplicity in design, strength, durability, and ease of operation, are points of supremacy that insure years of satisfactory service.

Mueller Means 100% Efficiency

Are your Drilling and Tapping Machines in perfect condition? If not, now—during January or February—is the acceptable time to have them repaired or to exchange them for new improved and perfected *MUELLER* machines.

Write for catalogue and prices on *MUELLER* Drilling and Tapping Machines or for detailed information regarding repairs or exchanges.

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Sarnia, Ont.

Water, Plumbing and Gas Brass Goods and Tools

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at Decatur, Ilinios, U. S. A.

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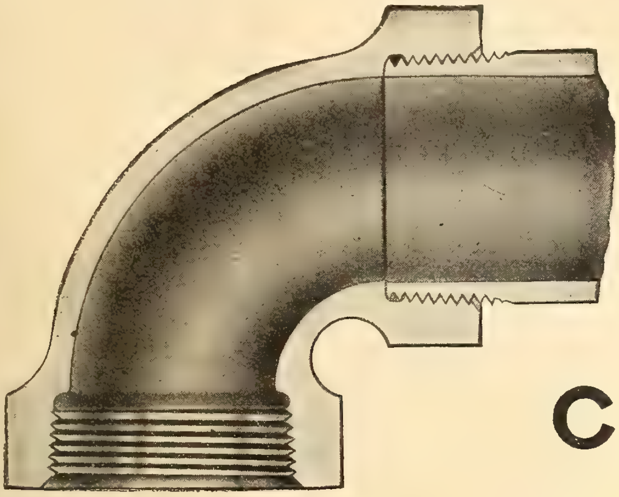

CRANE

DRAINAGE FITTINGS

ARE MADE WITH A SHOULDER AND ARE THE SAME INSIDE DIAMETER AS WROUGHT PIPE.

THE PIPE SCREWS IN UP TO THE SHOULDER MAKING A CONTINUOUS PASSAGE, LEAVING NO POCKETS IN WHICH SOLID MATTER CAN LODGE.

We recommend the use of our drainage fittings for Vacuum Cleaning installations. Fittings that are ordinarily tapped pitched for drainage work can be furnished without pitch to order.

All drainage fittings are recessed to allow easy entrance of the pipe.

Manufacturers of Valves, Fittings and Piping Equipment and Distributors of Pipe, Plumbing and Heating Supplies.

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Fans, Propeller
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- Imperial Oil Company, Ltd.
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- Shunk Mfg. Co.

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- Allen Bros.
- Paris Sand & Gravel Co.
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- Angstrom & Verochio
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- Canadian Blower and Forge Co.
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- Canadian Austin Machinery
- Canadian Link-Belt Co.
- Clyde Iron Works, Sales Co.

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- Clyde Iron Works Sales Co.
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- London Concrete Machry. Co.
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Hoisting Engines
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- Canadian Mead-Morrison Co.
- Clyde Iron Works Sales Co.
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- McGovern, T. J.
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- Canada Iron Foundries
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- Canadian Equipment Co.
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- Ormsby Company A. B.

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- Builders Iron Foundry

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- Hamilton Co., Wm.
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- Dom. Tar & Chemical Co., Ltd
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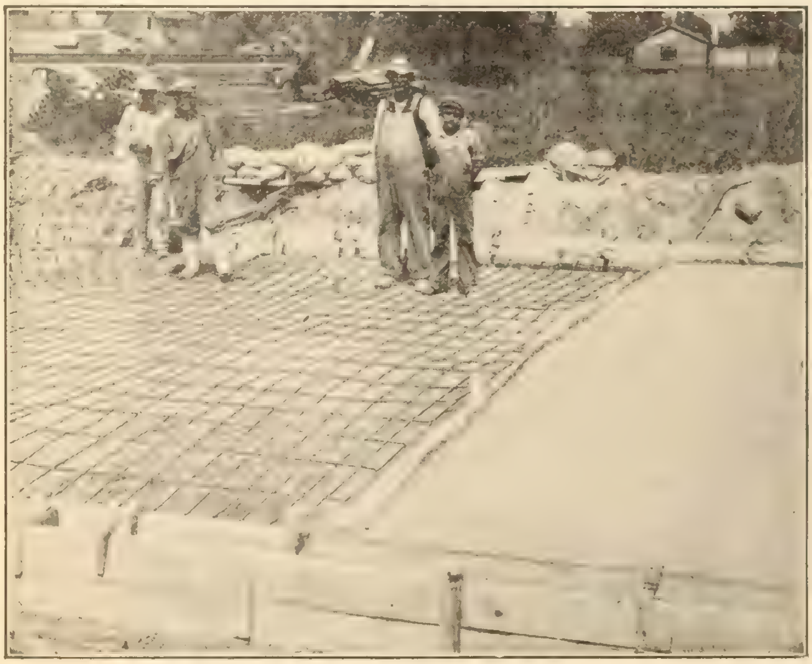

"IDEAL"
Galvanized
woven
Steel Wire Mesh
For
Reinforcing Concrete
Pavements
and
Roadways

Delivered prices quoted on application for any weight fabric

IDEAL FENCE AND SPRING CO. OF CANADA, LIMITED
WINDSOR ONT.
Branches: Winnipeg, Man. Montreal, Que.

The Business End

Do you ever stop to think that present day methods require more things of a boom than were ever conceived in early shovel days? Even five years have made a difference.

This is why Thew has not followed the old fashioned designs but has taken steps to perfect a boom designed and built on engineering principles backed by over twenty-five years of experience.

Plate girder construction is not new but it is new for small shovel booms as applied by Thew. The side members are built like a bridge, further stiffened by T-rails which also act as dipper guides. To give flexibility and confine it to the proper places these members are connected by seasoned oak blocking and held together by through bolts easy to take up. The boom hinges are of cast steel with a wide spread. No truss rods required.

Naturally the boom engine has three point support and it gets its steam through the swivel joint on the hinge pin instead of the old cumbersome piping and ball joints.

Good engineering requires gears on each side of the boom but Thew has gone farther by adding an intermediate shaft which guarantees that the dipper goes up and out and stays there without drifting.

Ask any Thew owner or write us.

THE THEW SHOVEL COMPANY, LORAIN, OHIO

ALMACOA EXPORT DEPARTMENT ALLIED MACHINERY COMPANY OF AMERICA ALMACOA

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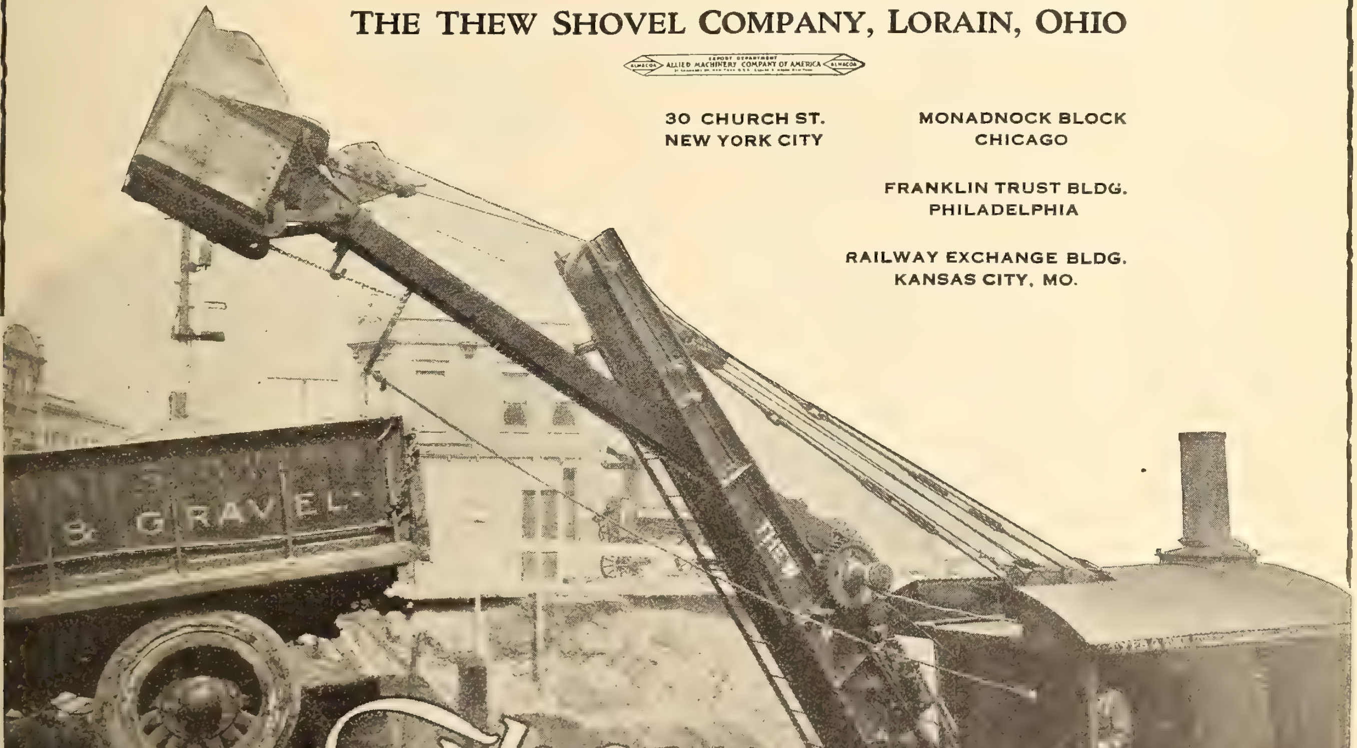
NEW YORK CITY

MONADNOCK BLOCK
CHICAGO

FRANKLIN TRUST BLDG.
PHILADELPHIA

RAILWAY EXCHANGE BLDG.
KANSAS CITY, MO.



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Clyde Iron Works
Hopkins & Company, F. H.
Mussens Limited

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Canada Iron Foundries
Canadian Pipe Co.
Dominion Concrete Company
Gartshore, Thompson Pipe Co
National Iron Corporation

Pipe Covering (Cold and Steam)
Canadian Johns-Manville Co.

Pipe and Tapping Machines
H. Mueller Mfg. Co., Limited

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Dom. Tar & Chemical Co., Ltd.

Planing Mill Exhausters
Canadian Blower & Forge Co.

Plaster
Britnell & Company
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Laurie & Lamb

Power Engines
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Luxfer Prism Co.

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Canadian Mead-Morrison Co
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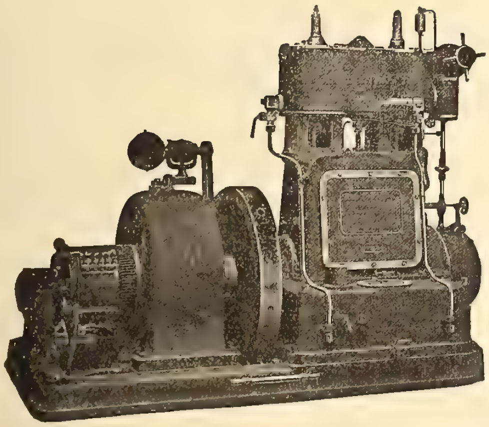

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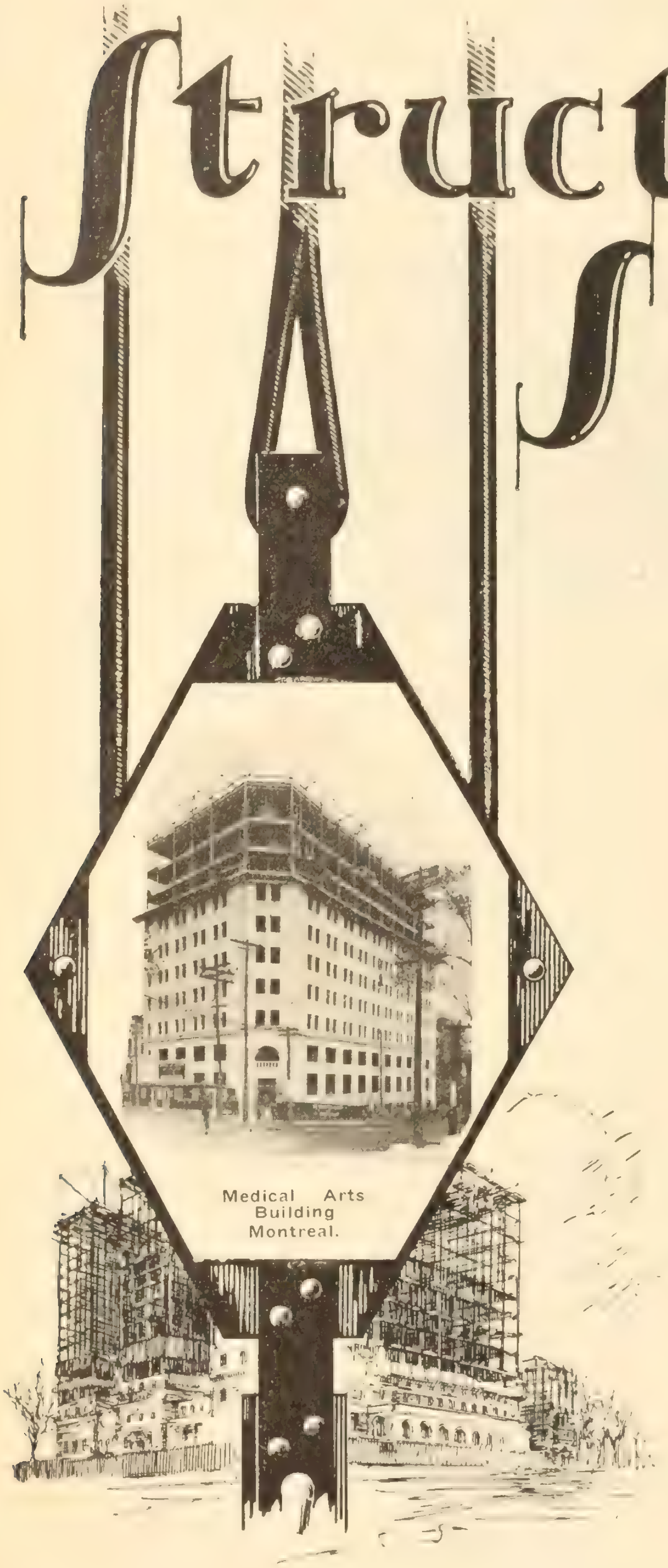

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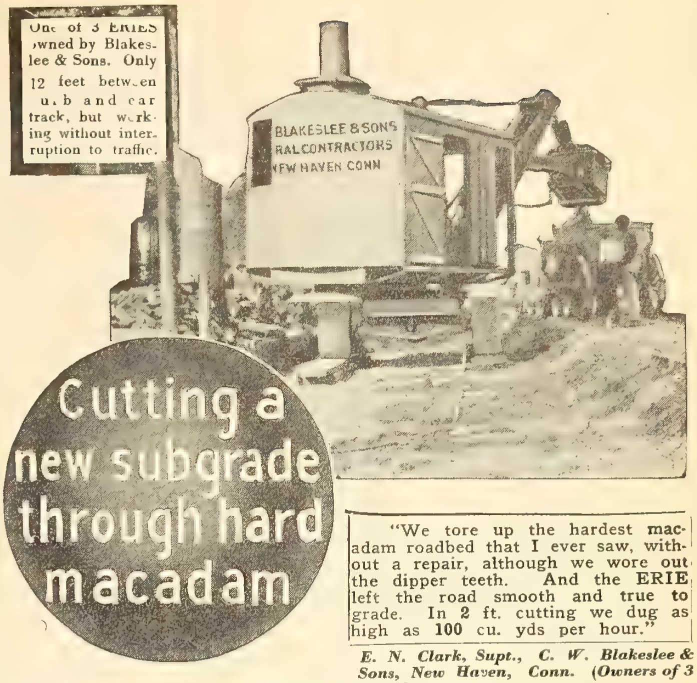

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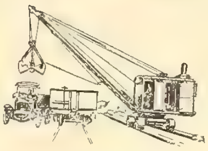

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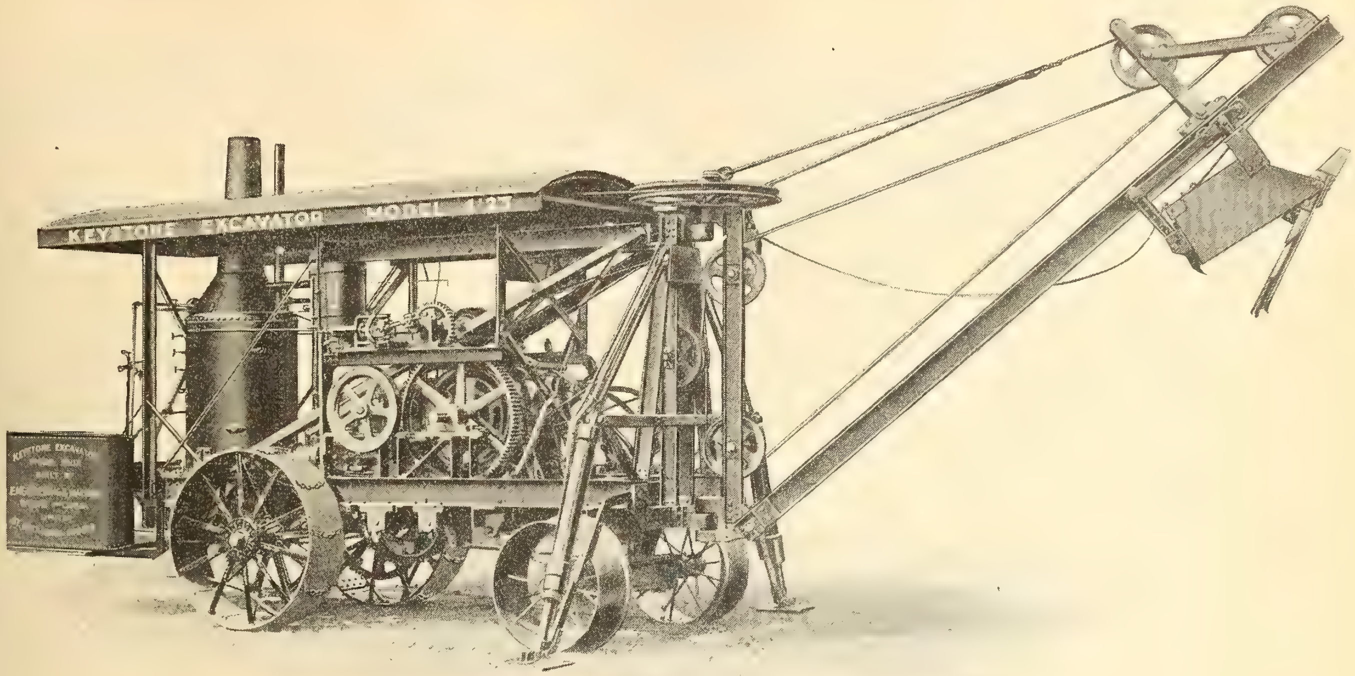

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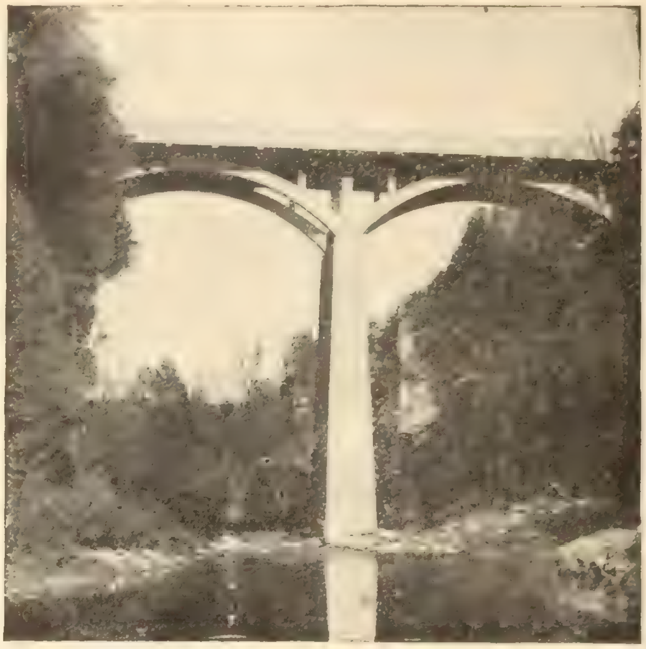

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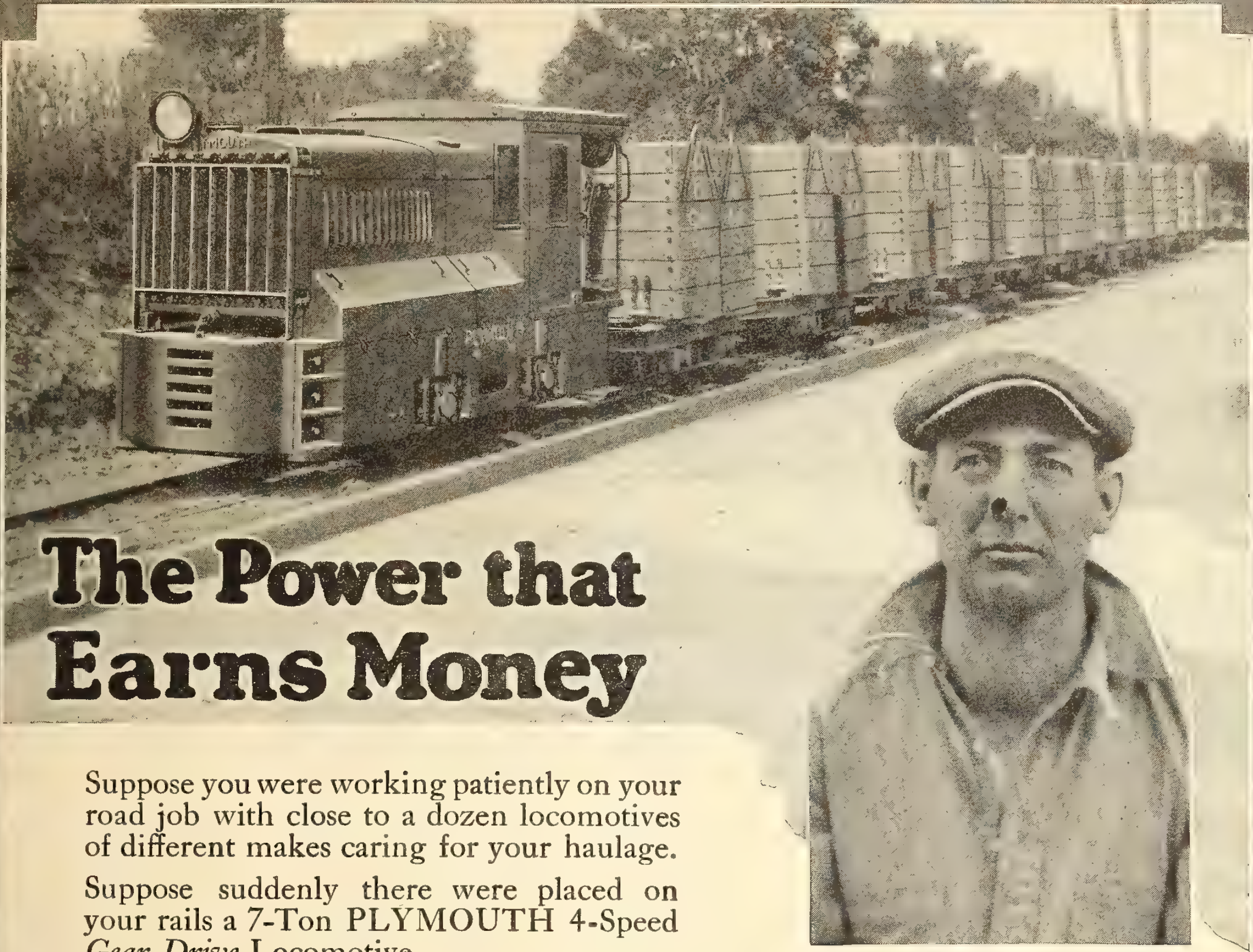

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HARRY B. GLADHEART

Mr. Gladheart's Letter

Putnamville, Indiana
December 4, 1922

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Preference for Canadian Goods

Buy "made in Canada" goods is an inconsistent cry in some cases but there are many more things to be said for it than against it. The objection is sometimes raised, it is true, that manufacturers are thinking of their own interests but we must not forget that what is good for manufacturers is good also for their employees and, indirectly, for the public at large. After all, the biggest factors in determining the cost of most of our products are load-factor and quantity production. The factory that is running to capacity all the year round is working at highest efficiency and is in a position to sell its product at the lowest price. It follows then that the consistent pursuit of a "Buy Canadian Goods" policy will gradually reduce prices to the public, while at the same time it improves the purchasing power of the public.

It would thus appear that the policy that says "buy in today's cheapest market—whether it is at home or abroad"—is wrong. It may appeal to the individual, but we believe that the strongest representations should be made to all public bodies to the end that municipal works of all kind, government works, schools, churches and all such, should utilize made-in-Canada materials just as they should employ Canadian architectural, construction and engineering talent.

Lengthening the Construction Season

Considerable attention has been given of late to the problem of overcoming the seasonal nature of construction. The fact that it has been demonstrated beyond question that winter conditions need not, generally speaking, be a serious impediment to building and other construction operations, has led to a realization of the folly of confining the activities of the industry to but a few months of the year. The concentration of the bulk of building in this way during a comparatively short period, brings many evils in its train—and perhaps most important, is the serious disturbance of the labor market—a scarcity in the summer months and unemployment in the winter season.

Many contractors, individually and collectively, and many government organizations and other bodies, have attempted to solve the problems incident upon the seasonal nature of the construction industry and it is believed that their endeavors have been reasonably fruitful, for to-day there is not quite the same prejudice against winter building that there was several years ago. In Ontario the Employment Service Council has made a very thorough study of the situation, as a result of which it has offered certain recommendations which are published elsewhere in this issue. This Employment Service Council was appointed by order-in-council on August 3, 1922, as an advisory body to the Ontario minister of labor and among the problems which came within its purview is this one of seasonal unemployment.

In its investigation of the building season question, the Council first made thorough enquiries by means of a questionnaire which included the following questions:

1. In your territory, can you build as cheaply this coming winter as you could last spring?
2. In your opinion can you build in your territory as cheaply in the winter, as in the spring, summer or fall; if not what is your estimate of the increase in winter costs and what are the main causes?
3. If the above answer is in the negative can you suggest any remedies which would tend to equalize costs in winter and in summer?
4. (a) In your opinion, would it be feasible to reduce labour rates say 15 per cent for a five months' period each winter, in an effort to bring about this equalization of costs?
   (b) Would you also consider a possible reduction in the price of materials for this winter work?
5. Would you consider it good policy to have government, municipal, educational and other

> work started later in the season, such as the fall, instead of bringing it on with the usual rush of work in the spring?

From the information which this questionnaire provided and from other data which was collected, the Council came to the conclusion that although building in the coldest winter months would cost somewhat more than in warm weather, growing experience on the handling of work in the winter would make possible economies offsetting this increase. The Council found also that underground work could be carried out as cheaply in winter as in summer. On the basis of these observations it, therefore, recommended that arrangements should be made for the commencement of as much public construction as possible in the fall instead of in the spring. In this way a great deal of unemployment would be alleviated and rush work in the summer season would be avoided. Indeed, the advantages of lengthening the building season are so great that every effort ought to be made to break the custom that has grown upon us of believing that winter construction is impossible or undesirable.

St. Maurice River Bridges at Three Rivers to be Strengthened

An important question which has come before the city council of Three Rivers, P.Q., is the remodelling of the bridges which cross the St. Maurice river between the cities of Three Rivers and Cap de la Madeleine on the Montreal-Quebec highway. The matter has been up for consideration on a number of occasions during the past four years and several engineers have been retained to make reports on the weakness of the present structures. To meet the expense of the repairs the council had considered making the bridges toll structures and a special act of legislature was requested to authorize the city to take such a step. No progress was made in this connection, however, as strenuous objections were raised by commercial and industrial organizations to another toll bridge as there were already several in the district.

The local Board of Trade and the city council then reached a common decision to ask the government to drop the previous agreement with Three Rivers and to undertake to pay two-thirds of the cost of the remodelling and the future maintenance of the bridges. The government has applied for an estimate of the work, and the city engineer, Charles Gelinas, has submitted the following figures:

To repair the piers and cofferdams	$ 47,525.25
To add a new beam on each side of the tramways tracks	21,674.30
To replace the chords in the superstructure	13,210.15
To replace the inferior trusses in two of the eastern spans	2,675.00
To rebuild the bridge flooring with creosoted blocks	60,125.75
To level the tracks	4,150.00
Total	$149,360.45

The council after consideration of this report has decided to ask its engineer to consider his report so as to include a foot bridge on one side of the bridge.

The first bridges on the river St. Maurice were built at Three Rivers in 1842. They were used for thirty years and condemned in 1872 on account of their old age. They were wooden bridges. During the period from 1872 to 1877 the public coaches plying between Quebec and Montreal had to stop at Le Passage and use a horse ferry boat. A second bridge lasted from 1877 to 1897 and was burned, incidentally making the traffic use the horse boat again. Then it was decided to build steel bridges and this was done in 1902, the work being carried out under the supervision of Louis Vallee, ex-chief engineer of the Public Works Department of Quebec. They were modern bridges at the time, calculated to meet the requirements of the district and travelling public for many years to come, but transportation has developed so marvelously in recent years that this structure cannot stand the heavy traffic of the present day. For that reason the remodelling is to be undertaken.

Meetings of the Toronto Branch E.I.C.

For the month of February the following meetings of the Toronto branch of the Engineering Institute of Canada are scheduled:

February 8th—"Rainfall and Its Measurement," by Sir Frederick Stupart, Director of the Meteorological Service, Toronto, in the Engineers' Club, 90 King Street West.

February 15th—A discussion on "Radials" to be introduced by a paper read by Mr. Henry K. Wicksteed, in the Engineers' Club.

February 22nd—The Toronto Branch is invited to attend the meeting of the Canadian section of the American Water Works Association to be held in the Carls-Rite Hotel, 174 Front Street West. Water works appliances will be on exhibition and a discussion will take place on water works matters. Further details will be announced later.

$2,000,000 Office Building for the Government

It is announced that the Federal Government will ask at this session of Parliament for the adoption of a credit of $2,000,000 for the erection of a new office building which will be situated at the north-west corner of Bank and Wellington Streets, Ottawa, on a site already owned by the government. The new building will be used to centralize a number of department branches, which are at present spread out in different small rented buildings. The architects of the Department of Public Works are at work on the preparation of the necessary plans for the proposed building, which will be, it is said, of a style to match that of the present parliament buildings.

A Plan of the Three Rivers Waterworks

The city council of Three Rivers, P.Q., has been presented with a very comprehensive plan of the waterworks of the city by the city engineer, Mr. Charles Gelinas. Although Three Rivers is one of the oldest cities in Canada there has never been a plan in black and white of the water supply system, and the engineer's endeavor to provide such a record has been greatly appreciated by the council. The plan indicates that the mains vary in size from 4 inches to 12 inches and Mr. Gelinas has made the presentation of his plan to the council an occasion to suggest that the 4-inch mains be supplanted by new pipes.

Investigation Shows the Construction Season Can be Lengthened

The Employment Service Council of Ontario which is an advisory body to the Minister of Labor of the province, has recently made investigations with regard to seasonal unemployment and the provision of relief work, especially in connection with the construction industry. The conclusions which the Council has come to are very important and are briefly summarized below.

In his inaugural address to the Employment Service Council of Ontario at its first meeting Mr. Rollo expressed a belief that, "a better understanding of the means of reducing unemployment would result from the study of the subject which the Council would conduct as part of its work."

The Council has recently made investigations with regard to seasonal unemployment and the provision of relief work and its views are briefly summarized below.

I. Seasonal Unemployment

In the highly variable climate of Canada most occupations are to some extent affected by the seasons. The most conspicuous example is, however, to be found in the building trades. The Employment Service Council finds that building operations in Ontario are mainly conducted at very high pressure during 8 months of the year and that there is a slack season of about 4 months during two of which very little building is done. This makes for the convenience neither of employers nor of workers in the building industry.

From the standpoint of employers a great deal of the work—an unnecessarily large amount—is rush work which involves bidding for workers against other employers at a time when there are no further supplies of labour available. The two necessary consequences are, firstly, that much overtime is done at an unnecessary labour cost to the employer and secondly, that a certain amount of the work is to be done by workers who cannot be considered fully competent.

From the standpoint of the worker this situation means that it is necessary to earn enough by work at very high pressure during a limited part of the year to tide over the slack season in case the worker is unable to find alternative employment during the slack season.

Beneficial to Both Employers and Employees

From either point of view, therefore, anything which can be done to increase the length of the building season will be wholly beneficial to the employer in increasing efficiency and reducing labour cost, and to the worker, in providing steadiness of employment and income in the place of uncertainty.

With a view to making recommendations on this question a sub-committee of the Council has conducted an enquiry among contractors and other interested bodies in Ontario and has received replies from about 60 leading contractors, and has consulted personally with a number of them. The replies to the questionnaire are generally speaking unanimous and may be summarized as follows:—

1. Building in the coldest part of the winter is on the whole somewhat dearer than in other seasons of the year. General contractors estimate the additional cost, owing to the cold weather, at about 10% while the average among other employers is about 15%.

2. Underground work, such as the laying of sewers, can be carried on as cheaply in winter as in any other time, owing to the economy in cost of shoring up which is made possible by the frost.

From this it appears that some building operations can be carried on continuously throughout the year without unnecessary expense, but that during the months of January and February building is likely to prove uneconomical in most cases. Nevertheless the Council believes that except for the period during which the province is actually snowbound it is not only possible but very desirable to carry on building operations without interruption.

Just a Custom

The fact that the building season is unnecessarily short at present the Council attributes mainly to the "custom of the trade" which is based partly on the failure of the public to realize how much the building season can be lengthened. The "custom of the trade" leads to the placing of a large number of orders with a view to simultaneous completion at the beginning of October, and results in a great congestion of orders in the Spring. If the public could be convinced, as it might if it were acquainted with the recent experience of many large contractors, that there would be a balance of gain in placing of orders, in the later months of the year instead of almost wholly during the first weeks of Spring, much could be done to lengthen the building season and so lessen the social cost of unemployment.

The most helpful first step towards the lengthening of the building season would be the development of a habit among school boards and other public bodies of placing their orders some months earlier than is now the custom, with this object in view.

The Council accordingly recommends:—

1—That, although building in the coldest winter months would cost somewhat more than in warm weather—the larger construction work such as schools, banks, factories and provincial buildings coming under this increase—growing experience in the handling of work in the winter months will make possible economies offsetting this increase.

2.—That, since it has been found feasible to have building construction carried on during the late fall and winter months with every degree of safety as to construction, municipalities, departments of the provincial government and boards of education particularly be asked to arrange their finances so as to start such work in the fall instead of the late spring, so as to get well under way before the cold weather sets in.

3—That municipalities and other similarly constituted bodies should be urged to commence their sewer work in the fall of the year, instead of the spring, as the costs will not be increased thereby; and that publicity be given to the above recommendations with a view to getting prompt action.

II. Relief Work

The Council believes that the provision of relief for the unemployed on the dole system is demoralizing. It tends to lessen the prestige of the employment offices and to diminish their sphere of usefulness by creating an impression that their primary function is to fit in with a dole system, as well as to demoralize the worker whose own interest demands that so far as possible he should have an opportunity of earning the means of providing for his needs and not be humiliated by resorting to a mechanical system of relief for which his main qualification is his lack of earnings.

Evidence is accumulating that there is a good deal less unemployment in the present winter than there has been in either of the last two winters. On the other hand some of those who are unemployed have had relatively few opportunities of saving against this contingency partly owing to the general reduction of wages during the last two years and partly owing to the irregularity of their earnings during the same period. The result is that they are likely to face considerable hardship and may be compelled to depend on public assistance once more.

Under the circumstances the Employment Service Council believes that the need of unemployed workers should be met by the provision of work instead of by the provision of a dole without work.

Estimating the Cost of Planking and Boarding

Data That Will Enable the Estimator to Compute the Amount of Material, Waste, Nails and Labor Required for Such Items as Floor and Roof Planking, Siding, Sheathing, etc.

By CHAS. F. DINGMAN, M. Am. Soc. C. E.

(Copyright 1923 by Chas. F. Dingman).

While one thousand feet board measure is undoubtedly the proper unit to use in calculating the quantities of materials required for all such items as floor and roof planking, flooring, siding, sheathing, etc., I have found that the square, or one hundred square feet, is the handiest unit to use when figuring the labor cost and I have used that unit in all cases in this article.

In figuring the cost of the materials necessary to lay a given area of planking or boarding, due allowance must be made for the waste due to matching, cutting of ends, cutting out bad spots, etc.

If the planks for any piece of work can be ordered directly from the mill and if the spacing between supports is uniform, it is often possible to purchase plank so that practically the only waste will be that due to matching. However, materials purchased from yard stocks are always subject to an over-run of five per cent, and due allowance must be made for this over-run when estimating. For instance, you might have a factory to build which required 100,000 f.b.m. of floor and roof planking, all in 20 ft. lengths. If you ordered your plank from a yard that did not have enough 20 foot pieces and added 21 ft. or 22 ft. pieces to make up the quantity, you would have to pay for that useless over-length up to a total of 5,000 f.b.m. Therefore, when estimating, be sure to determine whether you are likely to have to purchase stock from yards and make allowance accordingly.

Side waste, from matching, is a very uncertain quantity in planking, since it varies with the width of the plank. If you know in advance that you would get all planks of a given width, you could estimate accordingly, but the increase in price when all plank of one width are specified will usually overbalance any possible saving.

The Amount of Side and End Waste

Since matching usually takes ¾ inch from the width of a plank, it is evident that the percentage of side waste must be as follows:—

4″ wide planks	18¾%
6″ wide planks	12½%
8″ wide planks	9⅜%

An ordinary lot of random width floor or roof plank will not average over 6 inches wide, so it is well to allow at least 12½% for the side waste.

If the distances between supports are not uniform, or if those distances are not such that readily obtainable lengths of plank can be used, then additional allowance must be made for end waste on that account. In most markets, planks are usually available in lengths varying by multiples of two feet, from twelve feet upward. This means that, no matter what the actual length of plank required, you must buy and pay for planks of the next larger length in even feet. Thus, for an actual length of, say, 18 feet 4 inches, you would have to buy 20 foot planks and waste the difference, or 9.3%. Adding this end waste of 9.3% to a side waste of 12.5% we would have a total waste of 21.8% or practically 22%, which must be added to the estimate.

When splines are used, which is seldom the case with plank of a nominal thickness less than four inches, their cost is determined by allowing one foot of spline for each linear foot of plank. Thus, if the plank average 4″ wide, the total linear feet of splines will be three times the total area of planking; if 6″ wide, twice the area; if 8″ wide, one and a half times the area, and so on.

Number of Nails or Spikes Required

Various tables have been published for computing the quantities of nails or spikes required for floor and roof planking but most of those tables give quantities very much smaller than will actually be used.

Ordinarily, spikes used in planking should not be much shorter than ½ inch less than twice the nominal thickness of the plank, thus:—

For 4" plank use 7" spikes and figure 9 to the pound
For 3" plank use 60d "(6 " long) and figure 12 to the pound
For 3" plank use 50d "(5½" long) and figure 15 to the pound
For 2" plank use 16d "(3½" long) and figure 51 to the pound

The number required will be determined by allowing 2 nails or spikes for each plank on each bearing. Thus, planks 6" wide, 20' long, on 10' bearings, would require 6 nails per plank, or 0.6 nails per square foot or 6.0 nails per square.

On this basis the quantities would be as follows:—

Table 1. Nails Required.

		Per Square	Per M ft. b.m.
4" plank	6' supports	11.2 lbs.	28 lbs.
	8' supports	8.4 lbs.	21 lbs.
	10' supports	6.7 lbs.	17 lbs.
	12' supports	5.6 lbs.	14 lbs.
3" plank	6' supports	8.4 lbs.	28 lbs.
	8' supports	6.2 lbs.	21 lbs.
	10' supports	5.0 lbs.	17 lbs.
2" plank	4' supports	2.8 lbs.	14 lbs.
	6' supports	2.0 lbs.	10 lbs.
	8' supports	1.4 lbs.	7 lbs.
	10' supports	1.1 lbs.	6 lbs.

These are the actual quantities required but, because of the many wastes that occur on every job, it is always well to allow an increase of 50% of the computed quantities when estimating.

Whenever the conditions are such that the planks can be ordered of a very few lengths, that will work without further cutting, it is well to buy them "butted to exact length." Dealers usually make an extra charge for butting, but their charge is usually small as compared with the cost of butting on the job, even though power saws are available.

Cost of Placing

Having figured the cost of landing the planks at the level at which they are to be laid, as previously explained, we now have only to figure the cost of placing, including the setting in of splines, when specified, and the cost of spiking.

The cost of placing plank, because of the inconvenience in working and moving around, naturally increases as the plank span increases. On the other hand, since the number of nails per bearing is usually the same, the cost of nailing or spiking increases as the distance between bearings decreases. For all practical purposes, therefore, the same cost may be figured for all reasonable variations in plank span length.

Table 2. Labor Hours per 100 sq. feet.

Nominal Thickness	T & G	Splined	Laminated
2 inch	3		
3 inch	3.5	4.5	
4 inch		5.	7
5 inch		5.5	8
6 inch		6.	9

The column for splined plank includes the time necessary for placing the splines.

The time in Table 2 is given entirely in labor hours because local conditions will determine what portion of the work can advantageously be done by laborers and what portion must be done by carpenters. Beyond the butting of the plank, however, there is really very little work connected with the laying of plank that requires the skill of the carpenter.

Flooring, Boarding, Sheathing

In reading the previous article on the cost of timber-framing (issue of Jan. 17), the reader will have become familiar with the cost of transporting lumber to the site of the work and of placing it on the level at which it is to be used and no repetition is necessary here.

The same general principles apply to the application of flooring, boarding, sheathing, ceiling, etc., as apply to the laying of floor and roof planking but in these present items a greater number of factors affect the amount of waste involved and the amount and quality of the labor required.

If we always knew in advance that our lumber would be as good as we expect it to be, and our architects no more exacting than we read their specifications to be, it is probable that we could figure upon a smaller proportion of waste material and a greater production per man-hour. Under present market conditions, however, and with present grading rules, we are always likely to have to do a great deal of cutting out and rejecting, which means waste of material and added cost for labor.

In preparing the following tables all of these conditions have been given consideration and allowance made accordingly. In figuring, it is assumed that you will always consider small openings as part of the area to be covered, making no allowance for the saving and, in the cases of irregular or badly broken-up areas, you will make a judicious addition to the figured allowances for labor and for waste material.

Table 3. Flooring, Sheathing, etc.

Carpenter Hours per 100 Square Feet

	Time	Add percentage of waste required	Pounds of Nails	
3¼ face NC or fir flooring	2.8	15	4.5	(on underfloor)
2¼ face NC or fir flooring	3.0	25	5.5	(on underfloor)
3¼ face NC or fir flooring	3.3	20	4.5	(on joists)
2¼ face NC or fir flooring	2.5	30	5.5	(on joists)
2¼ face Oak	3.	20	5.5	(on underfloor)
2¼ face Beech, Birch or Maple	2.8	20	5.5	(on underfloor)
1 x 6 underfloor on joists	1.7	15	2.0	
1 x 8 underfloor on joists	1.5	15	1.7	
1 x 6 underfeed on joists	2.2	25	2.0	diagonal
1 x 8 underfloor on joists	2.0	25	1.7	diagonal
1 x 6 roofers on sidewall studs	2.4	15	2.0	
1 x 8 roofers on sidewall studs	2.2	15	1.7	
1 x 6 roofers on flat roof	2.2	15	2.0	
1 x 8 roofers on flat roof	2.4	15	1.7	
1 x 6 roofers on pitched roof	2.6	25	2.2*	
1 x 8 roofers on pitched roof	2.8	25	1.9	
Narrow ceiling on sidewalls	3.5	25	2.0	
Narrow ceiling on ceiling	4.	25	2.0	
Narrow clapboards on walls	4.	25	2.0	
Wide clapboards on walls	2.5	25	1.6	

*Add one hour to total figure for each ten linear feet of hips, valleys and ridges in the roof and 1½ feet b.m. waste lumber for each linear foot of hip, valley and ridge.

Shingling

While the square seems to be the most convenient unit for use in figuring the items just discussed, shingles can better be figured by the thousand. This is true because, even though the number of squares must be taken off the plan in order to compute the quantity of shingles required, it takes just as much labor to lay a thousand shingles with a 4 inch exposure to the weather as with a 5 inch exposure, but the area covered will be materially less.

Shingles, as delivered, vary in width but are counted on the basis of four inches wide, so the actual number of pieces in a bundle is immaterial, the charge is not a quarter thousand. Shingles are usually made sixteen or eighteen inches long but, since the exposure to the weather is what governs the quantity used, the length makes no difference in the number required but will make a difference in the cost because the eighteen inch shingles cost more per thousand. Also, because of the greater lap afforded they make a warmer house.

Shingles on roofs are usually laid 4", 4½" or 5" to the weather. On sidewalls they may have as much as 10" exposure and sometimes they are laid with the courses alternating, first a course of narrow exposure, then one of wide exposure.

Since the shingles average 4" in width, when laid 4½" to the weather, each shingle covers 18 square inches and 8 shingles cover one square foot. Upon this basis we may calculate our table as below.

diagonal

Table 4. Shingles Required Per 100 Sq. Ft.

Exposure	Number Required	Nails Required
4 inches	900	3.9 lbs.
4½ inches	800	3.5 lbs.
5 inches	720	3.3 lbs.
6 inches	600	2.7 lbs.
7 inches	515	2.3 lbs.
8 inches	450	2.0 lbs.
9 inches	400	1.8 lbs.
10 inches	360	1.6 lbs.

The usual method of figuring the labor, as given in most hand-books, is to take a certain figure for "plain roofs" and another one for "fancy roofs", but that hardly seems definite enough, so I recommened the following method.

Table 5. Labor per 1,000 Shingles.

On straight roofs	2 hrs. carpenter time
On curved surfaces	2.5 hrs. carpenter time
On sidewalls	2.7 hrs. carpenter time

To these figures it is necessary to add 10 minutes time for each linear foot of door or window casing or similar trim against which the shingles must be fitted, and also 20 minutes time for each linear foot of ridge hip or valley. With these additions, the tabular figures will be large enough to cover erecting and taking down the usual amount of scaffolding.

With the great variety of asphalt and other forms of proprietary shingles that are now on the market, it is hardly practicable to prepare a table that would cover them all, but the following figures will prove helpful.

Table 6. Labor per 100 Sq. Ft.

Asphalt strip shingles	2 hrs. carpenter time
Asphalt twin shingles	2.25 hrs. carpenter time
Asphalt single shingles	2.75 hrs. carpenter time

Furring and Grounds

No attempt will be made here to discuss the cost of affixing the many kinds of patented furrings and "spot" grounds. The manufacturers of most of such articles have collected data on their cost of installation and are glad to furnish information at any time. When using such information, however, be sure that you get it in such form that you can apply it to the problem you have in hand.

Sometimes strip furring is figured by the square, which is satisfactory if you make the proper allowances for waste, etc., but, since you will probably buy your furring on the basis of the number of linear feet, I recommend that method of figuring. Knowing the spacing, it is a simple matter to calculate the number of linear feet required, and then an allowance of at least ten per cent should be added to cover end waste on strips, short pieces, cross strips, etc. The labor can readily be figured by means of Table 7.

Table 7. Furring.

Carpenters' Time Per 1,000 Lin. Ft.

	On Joists	On T. C. Tile	On Gypsum Tile	On Brick
1 x 2	7	11	10	13
2 x 2	8	13	12	15
2 x 3	8.5	14	13	17

The figures for furring on brick are based upon the assumption that plugs have already been placed in the wall. If wood plugs must be inserted, add 6 hrs. to the figures given in the table.

The item of grounds affords more opportunities of guesswork than almost any other item in the carpenters' estimate. This is true because few people take the time to compute the quantities required or make any actual effort to find what it really costs to affix grounds. Care should be taken to include grounds for every kind of wood trim that is to be attached in plastered rooms and to study the detailed drawings carefully to find out just how much grounding is necessary.

Ordinarily, the following figures should be used:—

For base	2 lin. ft. grounds per lin. ft.
Chair rail	2 lin. ft. grounds per lin. ft.
Picture-mould	1 lin. ft. grounds per lin. ft.
Casings	1 lin. ft. grounds per lin. ft.

The labor may be calculated from Table 8.

Table 8. Grounds.

Carpenters Time per 100 Lin. Ft.

On brick	5 hrs.
Terra cotta	4.5 hrs.
Gypsum	4.5 hrs.
Wood	4 hrs.

If plugging of brick walls must be done, then the same allowances must be made as for furring.

The Cement Industry's Best Year

That the portland cement industry, as far as the United States is concerned, experienced the largest year in its history in point of volume, is indicated by the report of the United States Geological Survey for December 1922.

Production for the year was 113,870,000 barrels and shipments were 116,563,000 barrels representing an increase of 14.2 per cent and 21.4 per cent respectively over 1920, the best previous year. The latest information available as to the productive capacity of the mills is that shown in report of the Geological Survey for the year 1921—141,984,000 barrels—which would indicate that approximately 80 per cent of the capacity was employed during 1922. This does not take into consideration additional capacity constructed since 1921.

During December, production exceeded shipments by nearly 4,000,000 barrels and stocks at the end of the month were 9,134,000 barrels which is just slightly above the average for the five-year period 1918-1922

Meeting of Traffic Association Postponed

The 1923 convention of the National Highway Traffic Association, which was to have been held in Cleveland, Ohio, on February 19 and 20, has been postponed.

Gunite Coated Piles Used for Harbor Work

Timbers Covered with Concrete Shot in Place by Means of a Cement Gun are Found to be very Satisfactory for Underwater Use—The Methods by Which the Piles are Coated and Driven

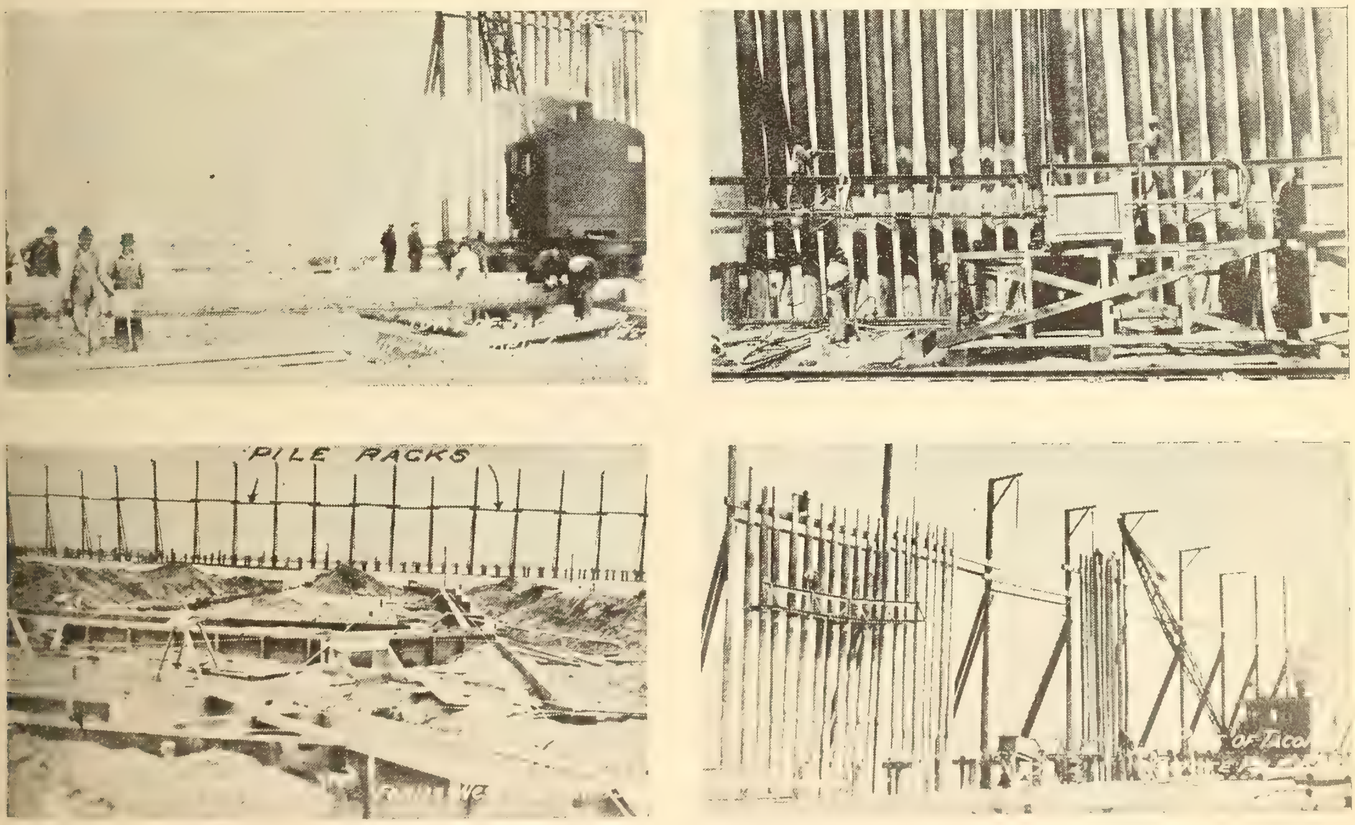
In the Contract Record of December 6, 1922, an abstract was presented of a report of the Institute of Civil Engineers relating to the deterioration of materials employed in harbor works. The protection of timbers and piling came in for a great deal of consideration but among the methods mentioned, no reference was made to guniting as a means of preventing the destruction of marine timbers. It is well recognized, however, that gunite has established itself as a very satisfactory form of protection and there are many notable instances of its use in underwater structures. The port of Tacoma, Wash., for example, has employed gunited piles recently in connection with a recently built pier and in the harbor of San Juan, Porto Rico, also they have been successfully adopted. The methods that were used were so extremely interesting that some reference to them will not be out of place.

The following information is based on a report made by one of the engineers of the United States Steel Products Co. after a thorough examination of the work at Tacoma.

When construction work was first started, the contractors received permission from the port engineer to attempt to expedite the work by applying the guinite in one coating. It was thought that it would be possible in this way to speed up the work, providing the piling after being coated was kept moist for a period of 48 to 72 hours. About one-fourth of the piles were constructed in this manner and after a time this lot had shown numerous hair cracks on their surface, which were the cause of much concern to the construction men. It was not known to what depth these cracks would penetrate and there was no possible means of determining with any accuracy whether or not the majority of the cracks would penetrate to sufficient depth to endanger the reinforcing fabric once the piles were driven and subjected to the action of the salt water. The sole remedy for the completed piles would be either to recoat with a thin layer of gunite or to coat with a waterproof paint or other preparation. It was decided that a coat of gunite would not be practical on account of its brittleness, the increase of time necessary and the increased bulk. It was decided then to apply with an air-brush as heavy a coating of asphaltum as possible as it was found, upon experimentation, that this method effectively closed all cracks.

Two Coats of Gunite Stopped Cracking

At the time of the discovery of the defects just mentioned, there had been completed about 40 piles, which were still damp and so far had shown no tendency to crack. The gunite on these piles had been applied in one coat as had the others and it was decided to experiment with this lot to determine whether or not cracking had been due to too rapid drying. On the face of it, it seemed that this would



Upper left: The reinforcing mesh being attached to the pile. Lower left: The pile racks. Upper right: This shows the method of shooting gunite. Lower right: This shows how the piles are swung into place with a locomotive crane.

be the cause as the racks where the piles were hung to be coated and dried were in an exposed location, the weather was very hot, and a rather strong wind was blowing across the tide-flats at all times.

In order to cure the piles at a slower rate, large blankets were constructed of heavy burlap and hung on both sides of the piles and kept moist with a constant stream of water running from the top. These piles were then cured more slowly than the preceding lot, but even so showed a tendency to surface cracks.

There was still another theory among the engineers connected with the project and it was decided to experiment along new lines of thought. Consequently the following method was tried: While the piles had been thoroughly soaked for ninety days before the application of the gunite, it was believed that there was still sufficient capacity for absorption of moisture in the piles to absorb from the gunite upon its application some of the moisture contained therein. This, of course, would be sufficient to create the hair cracks. In order to combat this it was decided to shoot the gunite in two coats, thus allowing the wood to absorb the moisture from the first coat, which would crack slightly, but would at the same time sufficiently protect the second coat from too rapidly drying and thereby eliminate the possibility of the development of cracks on the surface of the second coat. Experiments were conducted along this line and seem to be an absolute success. In the improved method of operation, when the first coat is applied, there is sufficient reinforcing left bare so that the second coating of gunite will be firmly bonded with the first.

A close-up view of the cement gun in operation.

The only trouble which has been encountered, has been the tendency of the coil of ¼″ round, which is at either end of the pile at the termination of the gunite coating, to show a tendency to act as a coil spring and expand at the impact of the hammer when driven, cracking the gunite slightly at that point. This will not be serious, however, as the area containing the coil at the base will be driven far into the mud and the coil at the top will be about 10 ft. above high tide. This is easily remedied as there is an area of about five or six feet at the top of each pile which is coated after being driven and cracks can be filled during that operation.

Method of Placing

This is absolutely the only trouble encountered in driving these piles. Of course, there has been considerable precaution taken to make certain that none of the coated piles received rough treatment and the method of placement used is quite novel. A 45′ length of 5″ steel pipe with a combination point and nozzle is used, together with a 250 lb. pressure water system to sluice out a hole in the sand, in which the pile can be dropped to a depth of about twenty feet before being driven at all. It then takes but a few light taps of the hammer to sink them the remaining distance and the first three or four tides wash in sufficient sand to pack them tightly in place.

It is the private opinion of all of the engineers connected with this job that it will be an unqualified success and they believe that the coating of piles with guinte will become common practice in marine construction.

An important consideration to be kept in mind in connection with work of this kind is mentioned in the following extract from a letter from Mr. G. W. Osgood, manager and chief engineer of the Port of Tacoma:

"Under our contract we had the piles delivered to us in the water with the bark peeled therefrom, and we found that it was quite difficult to tell whether a pile was fresh cut or not and we found that piles being cut for a period of longer than six months would invariably show up longitudinal cracks in the wood pile itself, which in turn would crack the gunite longitudinally. Piles in this condition we rejected and did not attempt to repair them, and if we were doing the work again, we would specify that the piles should be delivered with the bark on and peeled just prior to guniting."

Gunite Coated Piles in San Juan

In connection with the San Juan harbor job, referred to above, the following abstract of a report from A. Romero, the engineer in charge, will be interesting:

The San Juan Harbor Board advertised for bids for the construction of 2,750 lineal feet of concrete bulkhead with back filling and paving along the San Juan water front.

The specifications called for foundation and bracing piles either of reinforced concrete or of timber protected with a layer of reinforced concrete not less than three inches thick, at the option of the contractor. The cement coated piles were used. The latter were to conform to the following specifications:

"The piles shall be of yellow pine, Norway pine, cypress or other wood, approved in writing by the chief engineer. They shall be of sound live timber, free from bark, large knots, wind shakes, rot or other imperfections, and so straight that a line joining points in the middle third of each end will not fall outside of the pile. No pile shall be less than fifteen inches in diameter at the butt and seven inches in diameter at the top.

"The reinforced concrete envelope shall be rolled on by spreading a layer of concrete upon a 24 gauge "Key" expanded metal lath and rolling it so that there are at least two layers of steel to any section of the envelope.

"This protective envelope shall be long enough to extend two inches into the bottom of the cross cap and at least two feet into the mud bottom.

"The concrete used in either type of pile (i.e., the reinforced concrete or the cement coated timber pile) shall be class "A" hereinafter described, (Class "A" concrete was to be mixed in the proportion of one part of cement, two of sand, and three and one-half of broken stone or gravel, by volume).

"The foundation and bracing piles shall be spaced exactly as is shown in the drawings, in bents twelve feet center to center, and driven until the penetration under the last ten blows of a 3,000 pound hammer falling fifteen feet, does not exceed twelve inches or an equivalent penetration, according to the "Engineering News" formula, if a steam hammer is used.

"The piles shall be adjusted to a position and stayed as soon as possible after driving."

Variations From Specifications

The piles delivered at the site for use in the work were 50 ft. and over in length, and cut off as required by circumstances.

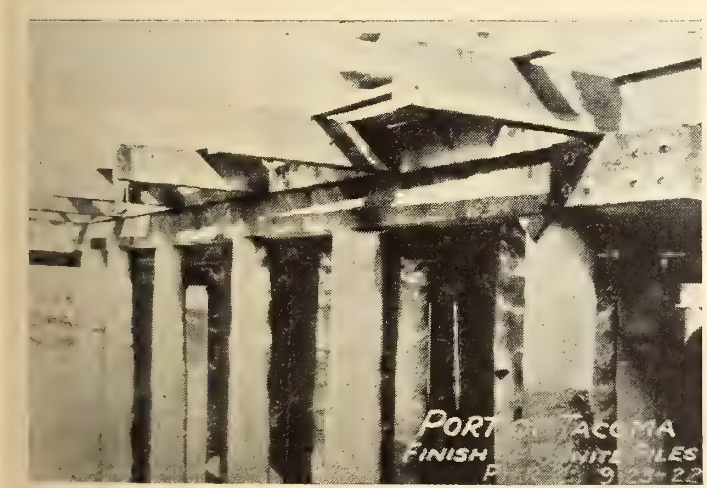
The piles were not coated as per specifications. Instead of the 24 gauge "Key" expanded metal, two ply wraps of No. 6-A triangular mesh fabric, as made by the American Steel & Wire Co., together with eight ¼" square rods, placed longitudinally and held ¼" from body of timber pile, were used. Naturally, the triangular reinforcement was superposed on the rods, which were held in place by spikes with looped heads, through which the rods were passed.

Instead of three inches of concrete the engineer in charge authorized the use of 2½" of "gunite" or rich cement mortar, applied by an air gun under fifty pounds pneumatic pressure. An examination of a number of the piles rejected indicated that they had about two inches of gunite coating. They were not rejected because of insufficiency of coating.

At the early stages of the job a drop hammer was employed, but soon after a steam hammer was substituted therefor, as being more satisfactory for the driving of the cement coated piles.

Preparation of Piles

The piles were prepared for use as follows: The timber piles to be coated were placed on skids which were about thirty feet apart, and which held the piles from two to three feet above the ground. After the reinforcement had been carefully nailed on, the cement mortar, in the proportion of 1:2, was applied by means of a cement gun which was moved back and forth between the skids by one man. Two men at the ends of the pile which was being coated turned it as required.



Shows the completed piles.

The piles coated during one day were allowed to stand on the skids until the following day, when they were removed by a derrick to a curing pile, where they were kept under wet burlaps for at least ten days. Care was taken of course not to injure the piles on being transferred from the skids to the curing pile.

"Cured" piles were allowed to "season" for at least twenty days more, so that thirty days elapsed from the time curing was begun to when they were driven.

Reasons for Changing Specifications

With reference to the application of the reinforcement, it was soon found that the method of winding it spirally around the pile so that at each turn one-half of the width of the reinforcing sheet would lap over the preceding turn was not satisfactory, as it could not be drawn tightly the full length of the pile, and at sections it bulged up so that pockets were formed when the mortar was applied and the cross section of the pile coating was not uniform throughout its length. It was found more satisfactory to apply the reinforcement spirally around the pile, but without over-lapping, tying the ends and edges together with wire, placing first one set of single sheets from near one end of the pile to near the other, and then reversing the operation by winding backwards the second set of sheets.

It was found in practice that the pile deflected considerably at the center while on the skids on account, naturally, of its own weight and that of the coating. The reduction in the thickness of the coating was found advantageous, therefore, in this respect, as the deflection at the center was reduced. The inspector in charge at the time the piles were drawn advised me that the first piles made, which had three inch coatings, did not satisfactorily resist the vibrations and blows when being driven, and flakes of the coating fell off under the action of the pile driver. Before the reduction in the thickness of the coating was effected, parts of the mortar frequently dropped off the pile while these were still on the skids. Cracks were greatly reduced after the thickness of the coating was changed. As the operators and men in charge acquired experience, the quality of the piles prepared greatly improved and their cost per unit was considerably reduced.

The contractor's organization for coating, handling and driving piles was as follows:

Pile Coating Gang: 1 foreman, 1 engineer and 1 fireman (in charge of engine and air compressor), 1 air gun operator, 1 derrick man, 3 men mixing mortar, 2 men turning piles while being coated on skids, 2 men wrapping reinforcement.

Pile Transporting and Driving Gang: 1 foreman, 1 engineer, and fireman for scow derrick, and a crew of 6 men.

The same gang which transported the piles from the "seasoning pile" to the site where needed, drove them.

Handling Piles

The method of transporting the coated piles from the skids to the curing pile was by means of a derrick and cables tied to the ends of the coated piles.

The piles which had been seasoned for thirty days and were ready for use were transported to the place where needed by a scow derrick used in conjunction with the pile driver.

Each pile, after driven, was carefully examined by a diver, who reported the damages or defects noted by him. Wooden forms were placed around the section of the pile where such cracks or defects had been found and fresh concrete poured in.

Superficial cracks were greatly reduced after the thickness of the coating had been changed from 3 to 2 inches and the manner of applying the reinforcement had also been changed. Hair cracks could not entirely be avoided. In one instance a number of piles were carefully prepared and kept in water all the time before driving with a view to eliminating such cracks. In appearance the piles were quite satisfactory, but under the action of the pile driver froth oozed out from minute cracks which had remained invisible until then.

The piles imported for this job were yellow pine, from Georgia. About 50 per cent. of them were rejected, mostly because they were under sized at the butts and full of large knots. No piles were rejected because of "boxing" unless this operation had so reduced the size of the butts as to make them fall under the specified sizes.

"I inspected the coated piles personally on two different days," reports Mr. Romero. "I found two from which pieces of the coating about one square foot in size had come off; all the others were in excellent condition, as far as could be ascertained from the boat. I inspected them when the tide was low, the tide range in San Juan being about 16 inches. One afternoon conditions were extremely favorable and the whole length of the piles above the bottom was discernible. Marine growths were adhering to the piles, but not to the extent of preventing the detection of defects or damages of the magnitude of the two noted. There were no indications that any borers had penetrated into the coated piles. The fender piles, which were of creosoted timber, on the other hand, showed unmistakable signs of having been attacked; in fact, the life of some of these were practically at an end. There are evidences that the two found damaged have received severe blows. They are near the outshore side of the bulkhead. This point was struck by the bow of a steamer. The blow was so severe that a portion of the exterior coating of the edge of the bulkhead was sheared off, and a number (four or five) of the buttresses were cracked."

Another Addition to McGill University

The Pathology Building, Now in Course of Erection, is an Imposing Structure—Details of the Layout

The new Pathological Institute now in course of erection at the north east corner of Pine Ave. and University St., Montreal, is a step towards making good McGill's promise to the Rockfeller Foundation, whose donation of $1,000,000 during the campaign fund was given on condition the University would afford increased facilities and accommodation for the faculty of medicine.

The building will provide long needed facilities and equipment commensurate with modern scientific requirements for the investigation and teaching of the science of disease, and it will link and unite hitherto scattered and disjointed laboratory and teaching departments into an organic whole. It will place them in close contact with each other and with their source of supply. The value of this undertaking, for orderly, well balanced instruction can hardly be overestimated and in accordance with its importance the governors of the University have permitted construction of a building of sufficient dimensions and with such equipment as to rank foremost among similar institutions on the continent.

The services of Messrs. Nobbs and Hyde, architects, Montreal, as well as Mr. R. Traquair and Mr. W. Carless, associate architects and Messrs. Stevens and Lee, consulting architects, were employed to draw up carefully laid plans, which on approval were placed in the hands of Jno. Quinlan & Co., Montreal, building contractors who already have the building well under way.

General Plans

The plans of the building, which lies principally along University Street, call for a main structure about 254 feet long and ranging from 77 feet in width to 52 feet. To the smaller end along Pine Avenue will be joined an annex measuring about 30 feet wide by 27 feet long, known as the Animal House, which will have a basement, ground and two additional floors. The construction of the whole will be of limestone and will conform to the Royal Victoria Hospital directly opposite on University Street.

The new Pathological Institute can be better studied if divided into two sections—one section about 78 feet long by 77 feet wide and having a basement, ground and first floor, and a section about 165 feet long by 52 feet wide with its basement, ground and two additional floors rising considerably over the former section. From the smaller section extends a semi-circular projection which forms part of an autopsy theatre. All the walls along the basement and first floor are two feet thick and together with concrete columns ranging from two feet six inches square to one foot four inches square and concrete foundation walls running down to rock, form a sound foundation for two floors and roof.

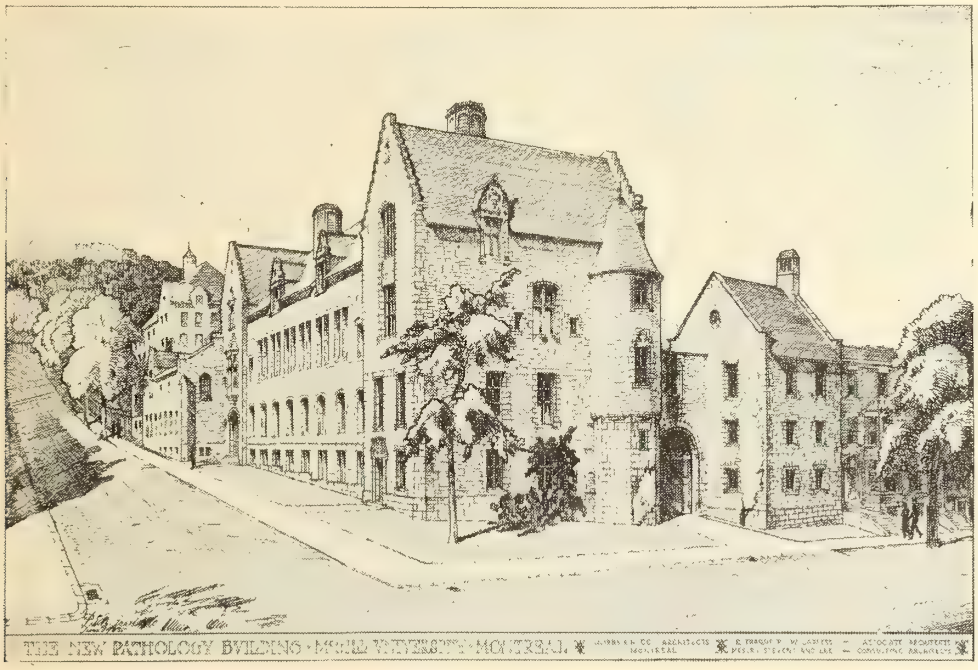
There will be on the basement plan a few air ducts passing between the rows of columns and also a tunnel running beneath the street and connecting with the hospital.

The ground floor of the smaller section of the building is divided by a corridor 9 feet wide at the end of which will be wooden steps and landing leading to the first floor. The corridor divides the ground floor so that on one side will be a morgue, a preparation room, a laying-out room, a mourner's room and an undertaker's room to which a delivery room is connected by a private passage running parallel to the main corridor, all of which will be provided with rubber top cement floor. Across the main corridor will be a machine room with a cement floor and with a partitioned corner known as the incineration room.

On the floor above and fitting into the semi-circular projection mentioned before will be the autopsy theatre in the form of a horse shoe. The theatre will be finished with marble floors as will also the two private autopsy chambers and the adjoining preparation rooms on either side of the large chamber. The desks in the autopsy theatre will take the form of a horse-shoe and also each succeeding row will rise above the other in order that the best possible view of the centre of the theatre can be had.

Excellent Lighting Features

Nothing will be spared to furnish good light, for through a glass hanging ceiling and also a glass roof, good daylight will be obtainable. Besides the marble floors, many other parts of the autopsy theatre will be finished in marble, such as parts of the walls close to doorways, and parts which connect with the morgue beneath. The rest of the walls will be finished in cement plaster. On the other side of the corridor on this floor will be two large rooms known as the Museum and Exhibition rooms. The latter will be provided with desks, forming the shape of a horse-shoe and rising one above the other on a slope of about 30 degrees to a railing and passage way running around three sides of the room. A lantern box for slides or movies will also be provided. Above the exhibition room there will also be a glass hanging ceiling similar to that in the theatre.


THE NEW PATHOLOGY BUILDING · McGILL UNIVERSITY · MONTREAL.

The architects' drawing of the pathological building of McGill University, Montreal.

The roof of the whole building well be covered with slate on the street side and with tar and gravel on the rear side with the exception of where the galvanized frame is provided for lighting purposes. There will be, however, a small copper dome over one end of the building.

The main entrance of the building which is on University Street, will join the two sections of the structure at its centre. On entering and mounting a few marble steps one will find himself in a large vestibule from which the stair leads down to the basement, and up to two additional floors. The basement of the larger sections of the building will be well provided for in the way of lockers and lavatories for the students, also a common room.

The ground floor above will be provided with many laboratory rooms of different sizes joining with a central passage way.

On the west side of the corridor will be six research laboratories with cement floors, a chemical laboratory and professor's office with linoleum floors, and on the east side will be one room nearly 100 feet long known as the Historical Laboratory, on opposite ends of which will be a professor's laboratory and demonstration room also with linoleum floors.

An animal operating room and adjoining corridor will lead over a small enclosed bridge to the animal house or annex.

The first floor is very similar to the one just described and only on the second floor is there any perceptible change. The corridors on the second floor will divide the usual professors' room and private laboratory from a kitchen, an incubator, stock and refrigerating rooms. The corridor is, however, short and leads through swinging doors into a large bacteriological laboratory which will measure 84 feet long by about 52 feet wide or the whole width of the building, at the south end of which will be a graduates' laboratory, a freight elevator and another incubator room.

Running the whole length of the bacteriological laboratory will be a glazed roof supported on a galvanized iron frame which will give excellent lighting to this large room.

The Cement Industry Overcomes Adverse Conditions

The cement industry, even more than other basic industries, is sensitive to adverse conditions in the fuel and transportation situation. Coal is consumed in enormous quantities and the finished cement is transported principally by rail, and these factors consequently govern to a considerable extent the production and distribution of the product. The industry appears to have met the heavy demands of the building situation, notwithstanding the obstacles interposed by the rail and coal strikes which occurred during the most active period of the construction season.

How Building By-Laws May Help to Reduce the National Fire Loss

By A. G. DALZELL

Paper read before the annual meeting of the Canadian National Clay Products Association

The fire loss for the Dominion of Canada for 1921 excluding the loss by forest fires was over forty-five million dollars, equal to $5.22 per head of population which is five times the average per capita loss of European countries. Rich as Canada is in natural resources this waste cannot be allowed to continue without serious consequences and remedies must be sought.

The early settlers in the Dominion were often confronted with the perils of fire from forest, bush or prairie, and for self preservation were always prepared to help each other to fight and put out fire. The peculiar perils of fire that originate through the opening up of new territories and the clearing of land, have greatly diminished, though the recent disaster in Northern Ontario has shown that extreme vigilance is still required. As settlement of the country has proceeded and communities formed it has been natural to organize for fire fighting purposes and for fire protection. In both the United States and Canada an endeavour has been made to check fire and reduce fire loss by the provision of trained fire fighting forces and the highest type of fire fighting equipment. Visitors to Europe marvel at the apparent inadequacy of European fire brigades, but the fact remains that they respond to a lesser number of fires and keep fires under control more effectively than do the fire brigades on this continent. The Dominion Fire Commissioner has made a comparison of the strength of municipal fire departments in 13 Canadian cities and compared them with 25 towns and cities of similar population in Great Britain and shows that for each square mile of territory Canada has nearly twice as many firemen, and in towns and cities of similar size Canada has four firemen for every one in Great Britain. As a specific instance Glasgow, Scotland is a city of the same area as Toronto, Ontario, but has double the population within that area. Glasgow has one fireman for every 5,100 of its population, whereas Toronto has one for every 820. In one year the Toronto Fire Brigade responded to 2,717 alarms of fire. In the same year the Glasgow Brigade responded to 921. Toronto paid for its fire fighting force in that year over two million dollars. Glasgow paid less than $465,686.

Climatic Conditions

Climatic conditions are often held responsible for the large proportion of the fire waste in Canada and there is no doubt but that the summers are hotter and drier in Canada than in Great Britain, and the winters also colder and drier, but Canada compares unfavorably even when contrasted with such countries as Norway and Sweden where climatic conditions and even building conditions are more comparable. The fire loss in Norwegian cities on a per capita basis is about one fifth that of Canadian cities.

The willingness with which Canadian citizens consent to taxation for the upkeep of their fire brigades and the anxiety they manifest that these fire fighting forces be provided with the most up-to-date and modern equipment shows that the citizens are not altogether indifferent as to loss caused by fire. It is of course realized that apart from material loss there is risk of the loss of human life. In the province of Ontario alone during the year 1921, 22 men, 16 women and 35 children lost their lives through fire and 1922 will show a still heavier toll of human life owing to the disaster in the North.

The primary purpose of building by-laws has been as much to reduce the risk of fire as to provide that walls and floors are capable of carrying the loads expected from them. By building by-laws the character of buildings in certain districts has been prescribed and the construction of buildings regulated throughout the whole municipal area and many of these regulations were originally framed for the purpose of reducing the risk of fire. There is however a tendency for building by-laws to get stereotyped and modifications or changes are made with reluctance and with great difficulty. Few towns or cities care to take any steps in advance of their nearest neighbours. There is always the fear that if building regulations are made too strict that building will be carried on just outside municipal areas and the development of the town proper checked. This points to the necessity of certain requirements being made compulsory by provincial regulation because municipal areas are bound to be extended and then the municipality loses much of the advantage of its own regulations by absorbing districts where no such regulations have been in force.

Everybody is Interested

All engaged in the clay industries are interested in these matters as citizens. They also know that the materials they manufacture have all been through fire and so are fire resisting, and that the extended use of their products would tend to reduce fire loss. It is perfectly legitimate business to try and educate the public to the value of the products they manufacture. It should not be difficult to show that though it is in their own interest it is much more to the interest of the general public that these materials should be used in place of other perishable materials, or that regulations should be passed to ensure that the material they provide is used in a proper manner. Just to indicate some of the more obvious changes that might be made in building regulations that will reduce the risk of fire is the object of this paper and a study of the subject will show that there are many others. ,

Confining our attention to the province of Ontario we learn from the report of the Fire Marshall of Ontario for the year 1921 that four classes of property contributed to 77 per cent. of the total fire loss of the province and in the order named, Factories, Stores, Dwellings and Barns. Factory Fires—using the word in a broad sense to cover all buildings conected with industries—account for 25 per cent.

of the total fire loss. This is what might be expected because in factories the buildings are large, materials are very inflammable and of considerable value. Many industries are also carried on in frame or very light construction buildings.

Store buildings account for nearly as great a loss as factories and the reasons are much the same though there is always a suspicion that incendiarism may account for some store fires.

Barn fires are mainly attributable to spontaneous combustion of the crops that are stored therein and the character of the construction of the building has little to do with the origin of such fires.

The striking fact about dwelling house fires is that whilst they only represent a loss equal to 14 per cent of the total fire loss of the year yet they represent 60 per cent of the total number of fires.

Conditions in Canada are not widely different from those that prevail in the United States where the cause of the origin of fires is more thoroughly investigated. The National Board of Fire Underwriters, as the result of an analysis of over three million fire adjusters' reports, place defective flues and chimneys as third in the list of major fire causes in dwelling houses, but first as the cause of the heaviest property losses. During five years ending 1920, the loss from this cause in the United States was estimated at over sixty million dollars, or equal to the value of 20,000 houses at a value of three thousand dollars each, or provision for a population of 100,000.

Electricity is Safest

Electricity in one form or another is blamed for the greatest number of house fires notwithstanding that electricity is the safest known source of light, heat and power. Fires started by electricity can often be attributed to some abuse of electrical installations or through pure negligence such as the very common one of leaving an electric iron with the current turned on. But as a rule these fires are quickly detected and soon controlled, whilst fires originating from defective flues and chimneys often start in the roof or between floors and ceilings, get a good start before they are detected and are very difficult to attack.

Looking to the cause of fires originating from defective flues and chimneys it has to be admitted that most chimneys are built with brickwork. In the case of the softer burnt brick there is a limit to their resistance by fire, but this limit is seldom reached in ordinary chimney construction. But the products of combustion of some fuels and natural gas in particular have a very severe disintegrating action on lime mortar and the softer bricks. This disintegration is quickened if dampness is present. This may occur through the burning of green wood or where chimney stacks are exposed to the weather. It is generally particularly severe where the chimney stack comes through the roof because snow lies against the brickwork there and because the brickwork is often not adequately pointed at this intersection. Thus open joints soon occur and sparks escape onto or under the shingles and start disastrous roof fires.

Bad Chimney Construction

Other reasons for brick chimneys failing are a once common practice of building chimneys on wood brackets or supported on the frame of a building. As the woodwork shrinks or settles the brickwork cracks and permits sparks to escape to ignite woodwork or inflammable materials. In frame buildings it is quite common to have the frame of the house completed and opening through floors and roofs trimmed before the chimneys are built. It is very difficult in such cases to get the brickwork properly pointed just where most protection is needed because the woodwork is so close. With a little extra care in building chimneys these hazards could be almost entirely eliminated. All chimneys should be built on a solid foundation from the ground up or on some rigid fireproof foundation. To avoid the risk of defective joints or disintegration through gases the brickwork should be double walled or otherwise the chimneys lined with vitrified clay fire linings.

Vitrified clay flue linings are made of hard burnt clay and are not susceptible to attack by the products of combustion. They provide a smooth surface with a minimum of joints, and soot cannot lodge to start chimney fires which send sparks onto shingle roofs or other inflammable materials.

The Fire Underwriters of the United States strongly endorse the use of clay flue linings. They have prepared and published a model ordinance for the construction of chimneys in which flue linings are advocated. Through their representations some of the States of the Union have passed State regulations governing the construction of chimneys which are applicable to all buildings in the state, whether within or without municipal areas. Many cities and towns of their own volition have also adopted these regulations and secured a benefit by obtaining a better rating from the Underwriters. In Canada a few municipalities such as St. Catharines, Welland, Kitchener and Timmins have adopted regulations securing the sound construction of chimneys.

To show that the heavy fire loss originating from defective flues and chimneys is not confined to dwelling houses it is instructive to note that during 1919 the Underwriters investigated fire losses in schools amounting to nearly six million dollars and placed defective flues and chimneys as the first strictly preventable cause of the origin of those fires. Also in the same year they investigated fires in wholesale grocery houses which caused a loss of one and a half million dollars and again placed defective flues and chimneys as the first preventable cause. In another investigation into the cause of the heavy fire losses in churches amounting to six million dollars, stoves and heating apparatus were named as the most frequent cause of fire and defective chimneys and flues as the fourth most frequent cause. The destruction from defective heating apparatus would in all probability be greatly lessened if the heating plant was enclosed within a brick walled chamber with fire resisting doors and ceilings.

Advocate Brick and Tile as Fire Resistants

Those who are engaged in the clay industries know that they provide in the shape of bricks and tiles building materials that are fire resistant to an unusual degree because they have already been through fire. They know that if buildings were constructed with these materials instead of more perishable and inflammable materials fire risk and fire loss would be greatly reduced. To advocate the use of such products in building construction, to endeavor to secure legislation, municipal and provincial, to facilitate or compel the use of such building materials is of course in the interests of such industries. But should there be any hesitation in consistently advocating measures to reduce fire loss even if some industries benefit by the passing of such measures?

Fire loss is absolute waste. No one benefits by waste, no one escapes the tax that waste involves. Heavy fire risks have to be met by heavy insurance and heavy insurance means heavy premiums. The cost of insurance has to be met by the consumer or user and so everyone pays in one way or another. By a dwelling house fire the savings of a lifetime often disappear in an hour and a whole family may be deprived of educational advantages because a home has been sacrificed to the flames. If independent authorities whose only interest is the discovery of the cause and elimination of the chances of fire have proved that defective flues and chimneys account for the loss of millions of dollars worth of house property, is it not worth while to insist that twice as many bricks be used for chimney construction or that flue linings be used to secure absolute protection against this fire hazard?

The building industry is probably the most conservative of all industries. Except in the matter of fittings, such as plumbing and electrical fixtures, the ordinary dwelling is built today much the same as it was one hundred years ago, and it is very doubtful whether the workmanship is as good as it was. In larger industrial and commercial buildings such as office buildings, hotels and factories some advance has been made, largely dictated by the self interests of those concerned, not because of compulsion by municipal ordinance. The ordinary citizen is, however, not versed in the details of building construction but trusts to architects and municipal authorities to see that his home is safe.

Building by-laws may be discussed from various points of view. The speculative builder and the city building inspector look at building by-laws from different angles, the architect and the land owner have also their own views as to the scope and efficiency of such regulations even as to the extent to which they safeguard property from destruction by fire, but surely none can fail to be convinced by the statistics of the Underwriters as to one of the major causes of fire.

Zoning Regulations

Every town and city should adopt zoning regulations. Most have already done so in a partial manner for fire protection but the policy can be widely extended with great advantage. The Burlington fire in Chicago showed how important it was that a high standard of construction should prevail in congested districts. This was a case where what was considered a fireproof building was set on fire by direct heat from adjoining buildings of inferior construction. The building itself resisted fire remarkably well but the contents were destroyed on many floors. In many Ontario towns as business sections develop houses are converted into stores, and then gradually modern buildings replace the converted dwellings. Such buildings are built in accordance with the existing by-laws, but they are often flanked by old buildings which are very hazardous from the point of view of fire. Buildings and land are taxed for municipal taxation on their value. Thus the expensive fireproof building, which requires little fire protection for itself, is taxed heavily to pay for protection for the cheap building that adjoins it, and the cheap building gets off lightly.

Some municipalities have seen the injustice of this and have passed regulations which prohibit more than a small percentage of the assessed value being spent on the alterations or repair of old buildings which are of inferior construction. If the building reaches such a stage of dilapidation that more than this must be spent it is considered that the time has come when such building should be replaced by a building erected in accordance with new by-laws to secure protection from fire and better sanitary conditions.

At first sight there may seem to be an element of injustice in such a regulation. Some would contend that an owner is justified in getting all he possibly can out of the life of his building. But the majority of property owners have begun to realize that the surest way to depreciate a business section, is to permit shack buildings to remain too long adjoining modern buildings. Such buildings are too often occupied by irresponsible merchants, sometimes by undesirable tenants as fortune tellers, palmists and gypsies. Though fire insurance companies do not officially recognize moral hazards, they are not oblivious to the same, and insurance rates are made accordingly and the whole neighborhood is penalized. As long as such buildings have an indefinite life property owners hesitate to spend money on adjoining buildings, and the improvement of the whole section is checked. Thus eventually through the selfishness of one or two the value of land and property of the many may be reduced and business instead of being well concentrated may be unduly dispersed to the disadvantage of the whole community.

Manufacturing in Fireproof Buildings

The large industrial corporations have also come to realize that manufacturing should be carried on in properly constructed fire resisting buildings. Insurance cannot cover loss which results from the disturbance of trade and the missing of seasonal markets or the destruction of stock which possibly cannot be replaced for twelve months. Manufacturers who erect such fire resisting buildings should be protected against unfair competition by other manufacturers setting up alongside them with shack type buildings, a menace to themselves, their employees and the community generally. Building by-laws should specify the area that may be covered by light frame buildings and provide for the erection of fireguard walls of brick or hollow tile to limit the spread of fire.

Greater care is required in the construction of store buildings. The heating apparatus ought to be enclosed within brick walls and elevator shafts in the basement at least ought to be similarly protected. There is also room for improved construction of the fronts of store buildings to lessen the chances of fire from exposure. There is far too much sham architecture in the shape of metal cornices on timber framing and other inflammable trim. This could be replaced by simple treatment in brickwork and if the walls are carried above the roof and surmounted with vitrified clay wall coping any fire that originates may be confined to the building where it starts. Metal cornices and sham parapets and fronts are a menace to firemen at work and assist in the passage of fire from one building to another. Those engaged in the brick industries might well offer a prize for a design for a suitable store front with say one or two floors over suitable for the average town business section and make an endeavor to secure an appropriate design for execution in brickwork only which should be absolutely safe in case of fire even if the interior of the building burnt out.

1,200,000 h. p. Development in the Saguenay District

Work has Started on the First Part of the Project Which Includes Twelve Units of 35,000 h. p. Each—Large Dams

The large power resources of Lake St. John, and the Saguenay River in the Province of Quebec, are shortly to be utilized in a hydro-electric development of momentous size. The Quebec Development Company has been incorporated for the purpose of financing the development and the initial program is well under way.

Sir William Price, of Price Bros. and Company, Ltd., and James B. Duke, president of the Southern Power Company (U.S.), have subscribed entirely the capital stock of the company, amounting to $25,000,000. The engineering of the development is in charge of W. S. Lee, chief engineer of the Southern Power Company. J. M. McCarthy and H. L. Brown are also named as being prominently engaged in the work. W. J. Bishop of Montreal is acting in the capacity of consulting engineer.

Several Dams Necessary

The project will necessitate the building of several dams. A diversion dam will be built at the Petite Discharge from Lake St. John to prevent discharge from that outlet, and the first development will be made as indicated on the accompanying map, at the beginning of the main outlet from the lake. A dam will be built here, from Ile Maligne to the north shore, and the power house will be located on the mainland just below the dam. This dam also comprises a long spillway section along the south bank of the island and another section across to the south shore. The great length of the spillway section, about 3,000 feet, is necessary to freely discharge the tremendous volume of water coming from Lake St. John and tributaries in flood season. It is figured that this dam will be about 100 feet high.

Measurements indicate that 400,000 horsepower can be produced at this first development, and preliminary installation of twelve generating units of 35,000 h.p. each is contemplated.

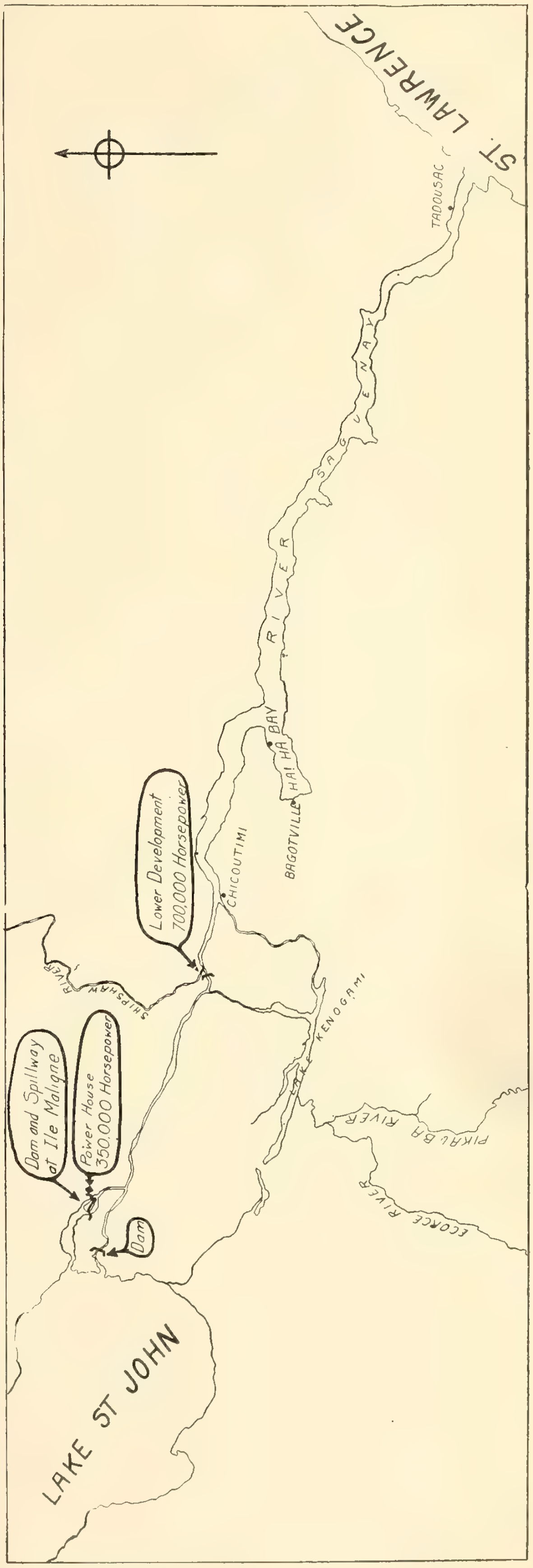
800,000 H.P. Second Development

A second development further down the river, as indicated, is projected sometime in the future. At this point, 22 miles from the lake, the river drops directly to tidewater and it is estimated that 800,000 horsepower will be available here. The development at this point will comprise a dam 200 feet high, built across a narrow section of the Saguenay, just above the mouth of the Shipshaw River. From here, the water will be conveyed by canal or penstock to the power house located on the bank of the Shipshaw. It is estimated that this power house will be able to use double the head obtainable by the upper one.

Preliminary Work Started

It is reported that preliminary work has already been started on the first development. This includes the initial steps in raising the lake level 20 feet, the sinking of cofferdams for the power plant foundations, and the construction of a railway for the hauling of material.

As regards an outlet for the power that will be



Map showing district in which development of 1,200,000 horsepower is projected. Locations of dams and powerhouses approximately given generated, half of the initial output has already been contracted for by Price Bros., for use in their paper mills. The main market must be created, however, and this would seem easy of accomplishment. The proximity of the navigable Saguenay, the fact that labor is plentiful in Quebec, and the abundance of near-at-hand basic materials all indicate that the country between Chicouitmi and Quebec City will sometime contain numerous industrial plants, all supplied from the Saguenay development.

Is it Preferable to Use Local Gravel Pits for the Production of Concrete Aggregates?

The Use or Non-use of Local Materials is Purely a Question of Whether it is Cheaper or Dearer than Shipped-in Material—How to Equip and Operate Local Pits—Instances of Large Savings

By H. J. KUELLING
Construction Engineer, Wisconsin Highway Commission

Paper read before the American Road Builders' Association

The subject of how to equip and operate local gravel pits to produce concrete aggregate may well be approached from one of two angles: First, from the viewpoint of the contractor who is to operate it, and, second, from the viewpoint of the engineer or public official who is to pass on the material. What the writer has to say will probably be a mixture of these two.

In the opinion of the writer, the use or non-use of local material is entirely a matter of economy; in other words, a question of which is the cheaper, local or shipped-in material. It is entirely out of the question for a province or local community to subsidize any commercial pit or quarry. The writer frankly admits that commercial pits and quarries can produce cheaper than temporary local plants and advises using them where the question of freight does not enter and the difference in truck hauls is not too great. However, as soon as freight on a railway enters into the argument, a handicap of ninety cents to a dollar a yard enters, a sum which alone more than covers the average production cost of most local pits.

No Difference in Quality

Instead of the commercial companies sitting back and criticizing, the writer believes there is a good business opportunity for some of them to go into local production with one or more small outfits, such as will be described below. Plenty of business could soon be worked up for such an enterprising producer, as many contractors with no experience in aggregate production would be only too glad to hitch up with him.

Some people criticize local material on the ground of quality. The good Lord doesn't change the sand and gravel if it is operated locally, rather than commercially. Properly operated, as many local pits are, just as good material is obtained in one case as the other. Assuming proper quality of sand and pebbles in the deposit, sufficient washing and separation of fine and coarse will produce satisfactory aggregates in either case. Improper operation will produce unsatisfactory material, as we all know who have had to reject material.

A question of equal importance with the equipping and operating is the locating and proper testing of sites. There is no doubt that much of the ill repute of local production can be traced to lack of knowledge before operations were begun. Then when the pit failed the whole question of local production was condemned.

In Wisconsin we believe the matter of locating the gravel is the duty of a geologist; consequently, all of our material parties are in charge of a geologist. His knowledge of geology shows him where to seek the best supplies. This has often been brought out in a startling manner in the finding of good pits where the local people insisted no material existed and where the average layman or engineer even would not suspect it. The duty of the engineer, who accompanies the geologist in locating, is to study the deposit from the physical viewpoint of whether or not it can be successfully operated.

Each party is equipped with a Ford ambulance of the type used in the World War. They are also fully equipped with shovels, picks, scales, containers, screens, glacial and soil maps, and any other tools necessary to efficiently conduct their work. Some of the parties carry along small cooking outfits while practically all of them sleep in their cars at night. They are paid a salary and have to maintain themselves out of this. They turn in an expense account for the car, however. Each party is given a number of proposed projects to cover.

The methods of each party vary, of course, with the kind of material for which they are searching. Those parties whose task it is to locate concrete aggregates have to spend more time and take more care in the results than do those parties who are locating surfacing materials.

A party locating aggregate for concrete construction must first try to locate a satisfactory deposit as near as possible to the center of the project. If this is impossible they must widen out in their search, always keeping in mind the disadvantages of long hauls and poor set-ups. They must also locate in each case the nearest water supply. They usually do some test pitting, especially on undeveloped deposits, to determine stripping and otherwise prove their conclusions. In general, a field test is made of the material in the nature of a silt, colorimetric and screen test. Their notes are kept on loose leaf forms provided by the Highway Commission. The deposits are spotted by section, town and range, and the owners' names obtained wherever possible. Each deposit is given a location number, these numbers starting at one and running upward consecutively in each county, there being no duplicate numbers in any one county.

Such surveys cost the state in the neighborhood of forty or fifty dollars per mile of project. After the surveys are made and the field information properly analyzed, it is up to the materials department and the district office to see that the most promising locations are properly test pitted.

Thorough Test Pitting is Essential

The test pitting is an exceedingly important feature of the work. It must be done extensively and thoroughly. The methods involved and the extensiveness, of course, vary with the kind of material being sought. If several miles of concrete road are to be built out of a proposed pit, it is necessary to test pit the site very thoroughly, especially if it is an undeveloped deposit. Enough holes should be dug to determine the extent and they should be dug to an adequate depth to determine the working face. We have dug holes thirty feet and over by using box sheeting of two inch boards four feet long dovetailed at the ends. It is an easy matter to construct a windlass operated by hand, and with a hole four feet square a pretty good sized bucket can be attached for raising the material out of the opening. The samples for testing purposes should be taken at the time of digging. Our requirement for such purposes is a representative sample of five hundred pounds of pit-run material from the deposit. The samples should not be taken from one hole but from several different holes. Probably the best method of handling the samples is to sack the material in cement sacks. Tags are filled out and one placed inside the sack and one attached after which they are sent express or freight collect to the laboratory. The man supervising the work also fills out an aggregate sheet furnished by the Commission describing the deposit, which sheet he sends direct to the Materials Department. Here a duplicate is made and sent to the laboratory and the original kept in the files.

From these samples tests are made, both on the fine aggregate and the coarse. Sand briquettes are made for breakage at three, seven and ten days. Coarse aggregate is tested in specimens 18″ long, 8″ in width, and 4.3″ in thickness. These are always made at the same time as specimens of standard material. Both are tested at the same time in a rattler and later in tension and compression. By always running these tests with a standard, we not only can compare the material with the standard, but with any other.

The information thus obtained is placed in the hands of prospective bidders through the medium of the district offices. The cost of testing material from one deposit is estimated to be about $35.00. If a prospective bidder is still not satisfied he may make an investigation of the material himself, and should by all means make a most careful investigation of all the physical features, such as water supply, topography, soil, roads, etc.

Of course, no proposed gravel pit can be guaranteed to be absolutely safe. By this we mean that even the best kind of test pitting a few pits where opened up, disclose objectionable features which were not apparent before. These features may be enumerated as a pit running to sand, too many oversize boulders, and a pit containing heavy seams of clay. These failures, however, are few and often where there has been a failure some bit of negligence or ignorance was responsible for it.

The writer has gone into all this detail of locating and testing of gravel pits to thoroughly impress the fact that local production requires considerable gray matter before one should think of the equipment and operation.

The Problems of Production

The production of concrete aggregates by means of a local plant is a problem of considerable magnitude. In the first place, let it be said that a plant for this purpose must be stationary. There is no such thing as an efficient portable plant for producing concrete aggregate. Another good feature of the successful plant is adequate bin capacity, for if there happens to be a temporary breakdown in the pit operating machinery and the bins are pretty well filled up, the trucks or other hauling equipment are still able to operate. Of course, the entire equipment must be efficient and efficiently operated as well. Too small a crusher or screens, not enough horse power, poor management, and a poor pump in case of washing, are some of the objectionable factors in a plant not operating efficiently.

The contractor in choosing his set-up and machinery has quite a problem on his hands. He should look the proposed site over well and take all the factors into consideration. He must consider the distance he is to be from the project and also what methods of hauling and charging the mixer are to be used. Of course, the problem of set-up does not always rest with the contractor, as there are quite a number of cases where the county has owned and operated a pit, supplying material for its own day labor crew, or else furnishing material to a contractor at a much lower price than he could purchase it from a commercial concern.

A well-built and efficient gravel plant for producing satisfactory aggregates for concrete pavement construction should cost in the neighborhood of $10,000 to $12,000, including the items of erection. A plant of this price has a bin capacity of about 200 yards, which ought to be sufficient. Below is a table showing the approximate cost of a stationary up-to-date gravel plant:

Crusher	$ 2,800
Grizzly screen	50
Blade Feeder	300
Cables, shieves, etc.	300
Hoist	1,000
Drag line bucket	450
Two 60 h.p. motors	2,200
Elevator	500
Screens	400
Lumber for bins, etc.	1,000
Cost of erection	1,000
	$10,000
Cost of washing equipment	700

Another item which is really an extra is the measuring device. Where batch trucks, for instance, are to be used this is an absolute necessity. There have been attempts to construct home made devices with mediocre success. There are mechanical devices on the market which are quite successful. They are, however, pretty expensive as an outfit costs about $500.00.

Typical Plants

Two plants of one contractor are identically alike, and while not absolute models of perfection are worthy of description. An arrow shaped drag line bucket handling about a cubic yard at a time pulls the material up and dumps it through a trap onto the blade feeder. This feeder is in the form of an endless belt which has a number of blades fastened thereon. This turns slowly, constantly dumping the material on the grizzly screen. Thus the material is fed gradually to the crusher while the drag line is making its return trip. The rejected gravel from the grizzly drops into a No. 4 gyratory crusher set at about an inch and one-half opening. Then the material is carried up to the screens in a bucket elevator about 50 feet high and containing approximately 140 buckets. The screens are of the revolving type, 4 feet in diameter and in sections. The first section is 6 feet with a one-fourth inch round opening; the second 4 feet with a one-fourth inch round opening, and the third 6 feet with elliptical opening one-fourth inch by one inch in size. For dry screening a screen of the last section type is probably the best. However, the last section of the screen should have two inch round openings to take care of any oversize material. A chute could be built from the end of this screen back to the crusher. It has also been found very necessary at times to insert a section of one-half inch round screen to waste the pea gravel sizes when the gravel in the deposit runs fine. Two 60 h.p. motors furnish the power for operating this plant. One takes care of the blade feeder, crusher, elevator and screens, and the other the double drum hoist operating the drag line.

The bins for this plant are 11 feet wide, 36 feet long, and 14 feet deep. They are set on a concrete foundation 38 feet long with a base of three feet and tapering up to 16 inches. The horizontal timbers resting on this concrete foundation and supporting the uprights are 10 x 12 's. The uprights themselves are 10 x 10 's and 12 x 12 's. Seven 10″ x 12″ timbers are used as braces for the uprights. There are also fourteen cross braces 6″ x 8″ in size, seven on each side. 2 x 12 's are used as floor joists spaced at 6 inch centers. There is also cross bracing on the side of 3 x 12 's, two being used together making six pairs on each side. The floor and sides of the bins are of 2″ x 12″ planks, the studding being the same size as the floor joists. They are double rodded, the long rods being 1½″ in diameter and the short ones 1⅛ inches. The bin supports or whales through which the rods are bolted are 6 x 12 's doubled. These hold the whole bin together and there are three tiers of them, the first one foot above the sill, the second four feet, and the third ten feet.

Washing Devices

A large proportion of local pits contain enough dirty material to require washing. There is also something in the proposition of expediting the work of the screens by washing, especially on damp days. A number of different types of washers are used. Probably the most common is the old tilting box type, with which nearly every one is familiar. The valve control or discharge for the washed sand in this type is dependent for operation upon the weight of the sand contained in the settling tank. There are a few mechanical objections to a washer such as this. First, the inertia of so great a weight makes the valve action slow, so that with uneven feeds the valve does not always close in time to prevent a "runaway." Secondly, a tank of this sort, is operated by balanced weights which to operate quickly must be set so that the valve does not close tightly when the feed of sand ceases but while the water is still coming. Sometimes, unless the valve is closed by hand, an amount of water and clay gets into the clean sand already discharged.

There are also steel conical tanks on the market which are quite expensive, but more efficient as the discharge is controlled by volume rather than by weight.

A good many pit operators are using a washer of a different type. This is really a mechanical conveyor sort of settling tank. It consists of a large rectangular wash box of wood, with a discharge for clay and dirty water at one end. The floor of this box slopes upward at the other end to the top. A number of blades are fastened to an endless chain which operates over sprocket gears at either end of the box. These blades dip down into the water, and by close contact with the slanting floor carry the washed sand to the top where it is dumped over into the bins. There is a space at both ends of each blade, which permits excess water to return to the tank. These blades continually agitate the dirty water in the tank and keep the dirt in suspension until it is carried off over the spillway. Plenty of clean water must be poured into the tank continually, and it is well to have several sprinklers playing on material as it is pulled up to be dumped into the bins. These washers are sold in two sizes, 4′ x 18′, and 3′ x 18′, respectively, and are priced at about $500.00, exclusive of any wash box lumber. The former size has a capacity of 40 tons of sand per hour and the latter 35 tons.

These washers, of course, are for sand only. It is sometimes and, in fact, always just as necessary to cleanse the gravel. For this a water pipe with an end spray can be discharged into the screens. This will aid very materially in pushing the sand through the sand screen into the settling tank, and also for separating the sand from the stone when it has a tendency to stick together in damp weather. It is also advantageous to have a section of closed screen containing angle irons bolted to the sides, which may be termed a scrubbing chamber. One of the principal requisites for a successful washing plant is plenty of clean water. Four inch pipe should be used, if possible, and a pump powerful enough and a water supply sufficiently adequate to produce 250 to 300 gallons a minute is necessary.

Savings from Using Local Materials

From one pit about 6.53 miles of road were built. The total job was 7.29 miles in length, equivalent to 77,176.4 square yards of paving. The low bid on this was $1.07 per sq. yard, exclusive of cement, as against the lowest price bid for commercial material of between $1.12 and $1.16. This is a difference of about 7 cts. per square yard or a total saving of $5,402.35 on the entire job. However, the facts that the pit and a good set-up were easily obtainable, that the hauls were good, and that several contractors were interested who wished to go into their own material production, all had a tendency toward producing one of the lowest bids per square yard in the whole state.

Another job consisted of about 8 miles of 18-ft. paving, the low bid being $1.19 per square yard. The lowest bid per square yard using commercial material was $1.49. There was thus a saving of 30 cts. per square yard. This meant a saving of approximately $25,344 on this one job. The plant was equipped with a hoist and upright boiler, arrow scraper, one 60 h.p. motor, a loader elevator, a bucket elevator, old style washing plant, screens and

160-yard capacity bins. Provision was made to shoot the rejected oversize stone back into the pit. From this plant approximately 25,400 cubic yards of sand and gravel were hauled out on the road. This meant an average of about 250 yards a day on the road and does not include an average of about 20 to 25 yards of material wasted each day. Material was hauled in trucks onto the road and stock piled every thousand feet. From the stockpiles a fleet of Ford batch trucks carried the aggregate to the mixer.

Another road, 3.3 miles in length, was constructed, the low bid being $1.29 per square yard using local material. The lowest price bid per square yard using commercial material was $1.45. A saving of 16 cts. per square yard was thus secured by using a local pit. This means a saving of $5.575.68 on the entire job. The material was trucked onto the roadbed, stockpiled and wheelbarrows used to charge the mixer. This was the second season that the contractor had operated this pit.

Another job of 4 miles was partly constructed, about 3½ miles being built. The lowest bid per yard using commercial material was $1.35, whereas the bid per square yard using local material was $1.11 or a saving of 24 cts. a square yard. This was a saving of $10,137.60 for the entire job. The material was hauled on the road and stockpiled, and wheelbarrows were used to charge the mixer. They had about 6,000 yards of material stockpiled on the subgrade before the actual paving work started. The equipment at the pit consisted of a bottomless drag line bucket, a plate feeder, a conveyor, a 9″ x 15″ jaw crusher, grizzly, a 36-ft. bucket elevator, a tilting box type washer, screens and bins, a 60 h.p. tractor, a double drum hoist and upright boiler, a 10-20 tractor, and a centrifugal pump. The bin capacity was small, it holding only 90 to 100 cubic yards. Provision was made to shoot the oversize stone back to the crusher. The 10-12 tractor furnished power for the pump which had a capacity of 450 gallons a minute, but only about 300 gallons a minute were actually used.

Production Not Large Enough

The production of this plant was small as it averaged only about 150 cubic yards of sand and stone to the road per day. The smallness of the crusher was greatly to blame for this as the 9″ x 15″ jaw crusher was only capable of 10 to 16 cubic yards an hour. What they should have had in its place was a gyratory crusher No. 3 or 4 in size. This bin capacity was small and the whole plant was not constructed in as stable a manner as it should have been, which probably accounted for the numerous delays and breakdowns. It seems true also from various observations that a scraper of the arrow type will handle a larger amount of material than the bottomless bucket.

$30,000 Saved on One Job

One county operated two local plants. One contractor built about 40,634 square yards, using material from one of the county pits. His price for this of $1.16 per square yard was based on material at $1.00 per cubic yard in trucks at the pit. This material had he shipped it in would have cost him $2.18 per cubic yard for gravel and $1.90 per cubic yard for sand in trukcs at the destination. The comparative hauls were about the same.

The other county pit kept two pavers going and about 8 miles of road was built using this material. It is rather difficult to get at the saving involved here as the contractor's bid did not include a material price since the material was furnished him by the county. The county highway commissioner, however, believes that material was being produced in stock piles for about 70 cts. a yard. Shipped-in sand and stone would have cost $2.03 and $2.20 per yard, respectively, unloaded in stock piles or bins. As in the neighborhood of 26,000 cubic yards of sand and stone were used in building the road it will be seen that considerable saving was involved (at least $30,000) by developing a local pit.

Both of these county plants used wash boxes. Each plant was equipped with a stiff leg derrick and bucket. The material as it came from the screens was loaded into a large stock pile. From here it was transferred into the big measuring hoppers and loaded into batch trucks.

Advantages of Developing Local Pits

It will be noted in most of the cases cited above that competitive bids were asked on local and commercial materials. This was done on practically all the early jobs to have figures for comparison. The longer in advance the preliminary information is obtained, the better, providing of course, the locations are properly protected by options so that no individual can corner the supply. The contractor or county which is to operate the pit should determine the output desired, the amount of crushing likely to be required, and the amount of water needed before designing the equipment to be installed.

While the production of local materials may add somewhat to a contractor's troubles, it also has its redeeming features. He ceases to worry about gondolas, freight trains, train crews, paying for water in sand and gravel, demurrage, and kindred other things. He has his work more centralized and can handle his paving crew more efficiently as he can better rely on the delivery of aggregates than were he dependent upon a railway.

In conclusion, the writer fully realizes that the use of local materials is a highly localized matter, but he also believes that where local material exists, the subject is deserving of the very best engineering and contracting talent that can be given it.

With us it has not only been the question of money savings. The use of local pits has enabled us to do work which could not otherwise be done, as it has relieved the railroads of business which they could not have handled and left equipment free for those jobs which absolutely had to be handled by rail.

Definitions of Contracting Expressions

At the meeting of the American Concrete Institute, held in Cincinnati on Jan. 22-25, the committee on nomenclature submitted a report which included a very comprehensive list of definitions of contracting terms. Since there is frequent enquiry for the meanings of many building terms, this list is reprinted herewith, just as the above committee submitted it.

1. Aggregate—The inert material used in making concrete; in general, aggregate consists of sand, pebbles, crushed rock or similar materials. (See coarse aggregate and fine aggregate).

2. Angle Fillet—A triangular strip of wood which is placed in the angle of a form for concrete in order to produce a chamfered edge in the concrete.

3. Bank Run Gravel—Normal product of a gravel bank including pebbles and sand in varying proportions.

4. Belt Course—A continuous horizontal course in the outside wall of a building projecting slightly from the elevation and usually molded in order to produce an architectural effect.

5. Bench Wall—The abutment from which an arch springs.

6. Billet-Steel Bars—Bars rolled from new billets.

7. Bond—(1) The resistance which is offered to the slipping of a reinforcing bar through the concrete in which the bar is embedded; the bond is measured in terms of the applied force per unit of surface area of the bar. (2) In masonry the mechanical disposition of stone, brick, or other building blocks by overlapping to break joints and to bind the wall together.

8. Book Tile—A tile designed to be held in place by means of crude tongues and grooves formed on the edges of the tile, and deriving its name from its resemblance to a book.

9. Bottom Form—The form unit used to define the bottom of a structural member, as a beam or girder.

10. Buggy (Concrete)—A two-wheeled hand cart used for the transporting of freshly mixed concrete.

11. Capital—See column capital.

12. Cement—See hydraulic, natural, portland, puzzolan and sand cements.

13. Cement Wash—A coating consisting of a mixture of cement and water applied to concrete surfaces (generally with a brush) to reduce permeability, or to give a uniform color.

14. Centering—A temporary support used in arch or dome construction. (Also called centers.)

15. Chats—A crushed rock of flinty character obtained as a by-product in the preparation of lead and zinc ores for smelting. It ranges in size from about ¼ in. to ⅜ in.

16. Chute (Concrete)—An arrangement of troughs or tubes through which freshly mixed concrete is transferred from one place to another.

17. Chuting (or Spouting) Concrete—The transporting of concrete by gravity through troughs or tubes.

18. Cinders—The hard waste product of the combustion of coal.

19. Clamp—See form clamp.

20. Coarse Aggregate—The coarser inert material used in making concrete, usually considered to include that material which is retained on a sieve having four meshes per lin. in. The upper limit of its size depends on various conditions but it seldom exceeds three inches.

21. Column—A vertical compression member whose length exceeds four times its least horizontal dimension.

22. Column Capital—An enlargement of the upper end of a column generally used in connection with flat-slab floors.

23. Column Head—See column capital.

24. Composition Flooring—A floor formed of various chemicals and a filler mixed with water and laid in a plastic condition, troweled smooth and then allowed to set hard.

25. Concrete—A compound of gravel, broken rock, or other aggregate, bound together by means of hydraulic cement, coal tar, asphaltum, or other cementing materials. Generally, (always in the specifications of the American Concrete Institute) when a qualifying term is not used, portland cement concrete is understood.

26. Concrete Projector—An apparatus used for forcibly depositing mortar or concrete from a nozzle by means of air or steam pressure. The concrete materials ordinarily are brought from the mixer to the nozzle through a hose.

27. Construction Joint—A joint or break between successive deposits of concrete, usually to facilitate construction.

28. Continuous Action—The working together of two or more flexural members (columns, beams, or slabs) to resist mutually a moment applied to one or more of the members.

29. Contraction (or Expansion) Joint—A joint or opening provided between two masses of concrete to allow for variations of volume.

30. Crusher-Run Rock—The unscreened output of the stone crusher.

31. Crushed Slag—Air-cooled blast-frunace slag of sizes included under "Coarse Aggregate."

32. Crushed Stone—Crushed natural rock of sizes defined under "Coarse Aggregate."

33. Curtain Wall—A wall which does not itself form a supporting member of the building of which it is a part.

34. Cyclopean Concrete—Concrete in which stones weighing more than 100 lb. are individually embedded. See also rubble concrete. (Replaces "rubble stone or cyclopean concrete.")

35. Deformed Bar—A reinforcing bar which has projections or indentations on its surface designed to frunish anchorage or additional bond between the metal and the concrete.

36. Dropped (or raised) Panel—The structural portion of a flat-slab which is thickened throughout an area surrounding the column capital to provide an increased resistance to compression or shear.

37. Expanded Metal—A mesh or lattice work made of sheet metal; used for lathing, reinforcing concrete in building construction, etc.

38. Expansion Joint—See contraction joint.

39. Fabric—See wire fabric and expanded metal.

40. Faced Surface—A surface produced by placing a special aggregate next to the forms and contiguous with the body concrete, or by applying a layer of another material after the completing of the concreting.

41. Fine Aggregate—The finer inert material used in making concrete, usually considered to include that material passing a sieve having four meshes per lin. in.

42. Finish—See granolithic, rubbed, sand blast, tooled, and washed or scrubbed finish.

43. Flat-Slab—A flat concrete slab having reinforcing rods extending in two or more directions, and having no beams or girders to carry the loads to the supporting columns. Various trade names are applied to flat slab floors using proprietary systems of reinforcement.

44. Footing—See pedestal footing and pile footing.

45. Form—A structure (or a structural unit which, in conjunction with other units, make up a structure) used to receive concrete before it has hardened and to mold it to the designed shape. Sometimes referred to as false work or centering.

46. Form Clamp—An arrangement of wood, steel, or iron members designed to hold forms together to resist the pressure of wet concrete against their sides.

47. Form Girt—A longitudinal timber laid crosswise under the joists and used as a girder to support the floor formwork.

48. Form Jack—A vertical support for the formwork of beams which is provided with a cross-piece at the top and two short diagonal braces.

49. Form Joist—A longitudinal timber placed under the panels of floor formwork.

50. Form Ledger—A horizontal timber used to brace the posts in floor formwork.

51. Form Mud-Sill—A timber member laid directly upon the ground to provide a bearing for the posts of the floor formwork.

52. Form Panel—A form unit used to define a flat surface of considerable extent, e.g., a slab "bottom form" or a wall "side-form."

53. Form Post—A vertical timber used to support the formwork of floors.

54. Form Re-Stud—See shore.

55. Form Ribband—A horizontal timber used to hold the bottom of beam side-forms in place.

56. Foundation Bed—The surface on which the foundation of a structure rests.

57. Girt—See Form Girt.

58. Granolithic Finish—A finish applied to concrete floors which exposes to view a surface layer of particles of coarse granite, or of other hard enduring rock, bonded with cement "mortar." The finish may be formed by troweling while wet to bring the crushed rock to the surface or by surface grinding after the concrete has hardened. Apparently, the name has been derived from the use of the crushed granite, in the surface layer.

59. Gravel—Loose material containing particles larger than sand, resulting from natural crushing and erosion of rocks. (See sand and bank run).

60. Grout (noun)—The material resulting from mixing cement and water, or cement, sand and water to a fluid consistency.

61. Grout (verb)—To fill a cavity or make a joint with grout.

62. Handle Nut—A nut with a forged handle to obviate the necessity for using a wrench; much used in formwork and other temporary construction.

63. Hooping—Reinforcement in the form of hoops or wire spiral placed within a concrete column. The hooping is designed to resist horizontal tensile stresses in the column and assists in holding the column bars in place during the placing of the concrete.

64. Hydraulic Cement—Any cement having the property of setting and hardening under water.

65. Insert—A socket usually of cast or malleable iron, either slotted or tapped to receive bolts for attaching shaft hangers, sprinkler pipes, or other articles, to the concrete.

66. Jack—See form jack.

67. Joist—See form joist.

68. Lagging—Strips used to carry and distribute the weight of an arch to the ribs or centering during its construction.

69. Laitance—The extremely fine particles which separate from freshly deposited mortar or concrete and collect on the top surface.

70. Ledger—See form ledger.

71. Leam—A soil consisting of a natural mixture of clay and sand, the latter being present in sufficient quantities to overcome the tendency of the clay to form a coherent mass.

72. Mixer—See pneumatic mixer, and concrete projector.

73. Mortar—A material used in a plastic state, becoming hard in place, to bond together such materials as brick, stone, tile, gypsum blocks, terra cotta, etc., in walls, partitions, columns, foundations, piers, floors and roof arches, etc., also to form wearing surfaces. The word "mortar" is used without regard to its composition, defining its use as a binding or wearing material, as contrasted with the words "stucco" and "plaster." An exception to this statement is the case where small aggregate less than one-fourth in. is mixed with the building material used to make mortar briquettes or cubes for test purposes.

74. Mud-Sill—See form mud-sill.

75. Natural Cement—The finely pulverized product resulting from the calcination of an argillaceous limestone at a temperature sufficient only to drive off the carbonic acid gas.

76. Negative Reinforcement—Reinforcement so placed as to take stress caused by negative bending moment.

77. Panel—See dropped panel and form panel.

78. Pebbles—Naturally rounded coarse aggregate.

79. Pedestal Footing—A member supporting a column in which the projection from the face of the column on all sides is less than one-half the depth of the member.

80. Pile Footing—A footing which rests upon piles. The heads of the piles may or may not be embedded in the footing.

81. Plaster—A material used in a plastic state to form a hard covering for the interior surface, walls, ceilings, etc., of any building or structure. The word "plaster" is used without regard to its composition, defining only its use and location as contrasted with the words "stucco" and "mortar."

82. Plums—Stones of large size, usually over 3 in., which are added to the concrete during placing.

83. Pneumatic Mixer—A combination of machine and pipe line in which concrete is mixed and conveyed simultaneously by means of compressed air.

84. Point (verb)—To apply mortar to a joint in a masonry or concrete structure; or more generally, to apply mortar or plaster anywhere to a structure in finishing lines or surfaces.

85. Portland Cement—The product obtained by finely pulverizing clinker produced by calcining to incipient fusion an intimate and properly proportioned mixture of argillaceous and calcareous materials, with no additions subsequent to calcination excepting water and calcined or uncalcined gypsum.

86. Post—See form post.

87. Projector—See concrete projector.

88. Punching Shear—The shear in a structure on the periphery of a strut or other member applying a concentrated load.

89. Puzzolan Cement—The finely pulverized product of a mechanical mixture of volcanic ashes or basic blast-furnace slag with powdered slaked lime. When slag is used this is sometimes known as slag-cement. This should not be confused with portland cement manufactured from a mixture of slag and

limestone but calcined subsequent to mixing.

90. Precast Concrete—Concrete cast in separate units which are later assembled into a structure, (See unit construction).

91. Rail Steel Bars—Bars rerolled from railway rails.

92. Raised Panel—See dropped panel.

93. Reinforcement—The metal (generally steel) placed in a concrete member to assist in resisting the stresses which come upon the member. (See also negative reinforement).

94. Reinforced Concrete—Concrete in which tension or compression reinforcement is embedded in such a manner that the concrete and the reinforcement act together in resisting stresses.

95. Reinforcement Spacer—A device for maintaining the reinforcing bars or units in the proper positions relative to each other and to the boundaries of the members.

96. Re-Stud—See shore.

97. Ribband—See form ribband.

98. Rubble Concrete—Concrete in which stones weighing not more than 100 lb. are individually embedded. (See also cyclopean concrete).

99. Rubbed Finish—A surface produced by rubbing with carborundum or with cement bricks or wooden floats to remove form marks and irregularities.

100. Sand—The finely divided material generally of a siliceous nature resulting from the reduction of rock by natural forces to the size included under fine aggregate.

101. Sand Blast Finish—A surface produced by the wearing effect of a sand blast.

102. Sand Cement, Silica Cement—The finely pulverized product resulting from the intimate mixing and grinding in varying proportions (generally one-half of each) of siliceous sand or other siliceous material and portland cement.

103. Screed—A guide (usually of wood) used to gauge the finishing of mortar or concrete to required surface or grade.

104. Screen—A metal plate with circular perforations used for separating granular materials into different sizes.

105. Screenings—See slag screenings and stone screenings.

106. Set—(noun)—A change from a plastic to a solid or hard state.

107. Shore—A prop or support. A temporary rough timber used to support the weight of a floor after the forms are stripped and until the concrete has thoroughly hardened.

108. Side-Form—The form unit used to define the side of a structural member, as a beam or girder.

109. Sieve—A woven wire cloth with square openings for separating granular materials into different sizes.

110. Silica Cement—See sand cement.

111. Silt—A deposit of mud or fine earth from running or standing water.

112. Slag—See crushed slag.

113. Slag Screenings—Crushed air-cooled blast furnace slag of sizes defined under "Fine Aggregate."

114. Sleeper—A strip of wood placed above or in a concrete slab to serve as a nailing strip for wood flooring. The term "screeds" is sometimes used inaccurately in this sense.

115. Sleeve—(1) A tube or box of wood or metal placed on or in the form of a concrete floor or wall in order to provide a hole for the passage of a pipe, bolt, or wire, or to act as a spacer for the forms.

(2) A short length of pipe used to hold in alignment the butted ends of compression reinforcing bars.

116. Soil—A mixture of fine earthy materials with more or less organic matter, resulting from the growth and decomposition of vegetation or animal matter.

117. Spacer—See reinforcement spacer.

118. Spiral Hooping—See hooping.

119. Spouting Concrete—See chuting concrete.

120. Standard Sand—Natural sand from Ottawa, Ill., screened to pass a sieve which has 0.0335-in. openings and retained on a sieve which has 0.0223-in. openings provided that not more than 5 g. pass the latter sieve after one minute continuous sieving of a 500 g. sample. This sand is used as aggregate in standard strength tests of cements.

121. Stirrup—A reinforcing unit (vertical or inclined) used in the web of a flexural member to resist tensile stresses set up in the beam by a combination of shear and longitudinal tension.

122. Stone Screenings—Crushed natural rock of sizes defined under "Fine Aggregate."

123. Stucco—A material used in a plastic state to form a hard covering for the exterior walls or other exterior surfaces of any building or structure. The word "stucco" is used without regard to its composition, defining only its use and location as contrasted with the words "plaster" and "mortar."

124. Tooled Finish—A surface produced by tooling with a bush hammer, crandall or other desired tool to a uniform and finished surface.

125. Tooling—The finishing of a concrete surface with a special tool in a manner to show the marks of the tool.

126. Tremie—A water-tight pipe of suitable dimensions used generally in a vertical position for depositing concrete under water; a tremie reaches to the surface where the concrete is being deposited and is generally equipped with a funnel shaped hopper at the upper end.

127. Unit Construction—The utilization of precast concrete members in building construction. (See precast concrete).

128. Voids—A term applied to the space between grains of sand or to the spaces between the fragments of gravel, crushed stone, or other aggregates. The voids are expressed as a percentage of the gross volume of the material. The term is also applied to the spaces throughout a mass of concrete, mortar, or paste that are filled with air or water.

129. Wall Beam—A beam which spans between exterior columns of a structure and which is used as a supporting member for the floor slab at its outside edge. Frequently the wall beam carries the curtain wall for the story above.

130. Wall Bolt—An iron bolt threaded at both ends used in formwork to bolt the forms of the two sides of a wall together; it is sometimes used in column forms in a similar manner.

131. Washed or Scrubbed Finish—A surface produced by rubbing or scrubbing concrete to expose the aggregate.

132. Weep Hole—A hole in a wall, floor, or other structure, made for the purpose of providing drainage.

133. Well—A vertical compartment or shaft in a building or a series of openings in vertical alignment through the floors of the building.

HIGHWAY ACTIVITY IN NOVA SCOTIA

Two Views of the Halifax-Bedford Road Constructed Under Federal Aid.

The Contract Record's

Weekly House Suggestion No. 55

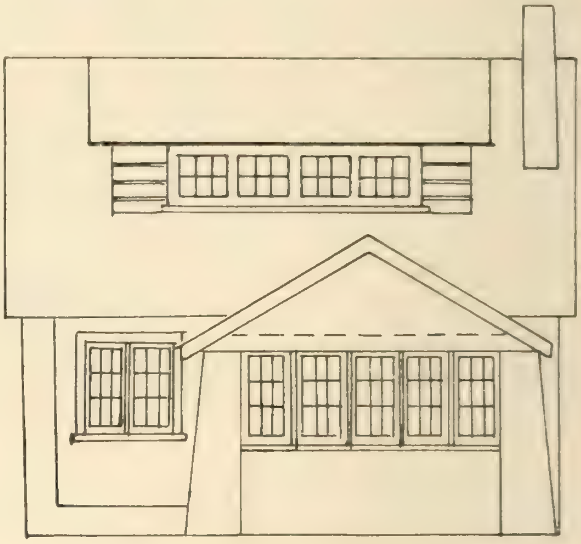
The plan suggestion for this week is a two-storey bungalow type of pleasing proportions and interesting layout. The accompanying plans and elevation show the general features of the design and indicate a few of the unique ideas that have been developed in this house which measures 25 feet wide by 52 feet in depth over all.

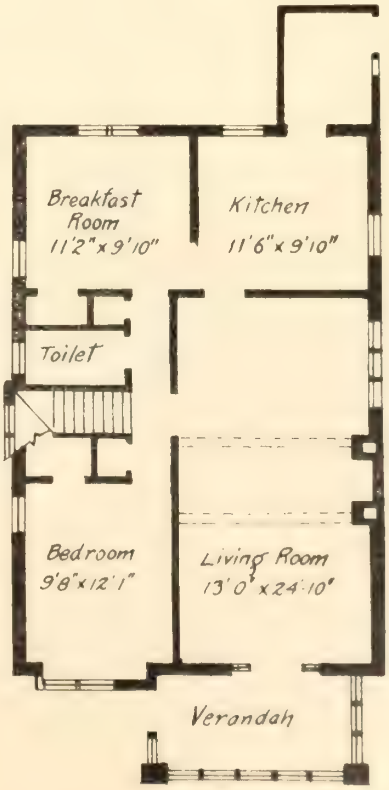
The main front feature is a verandah enclosed in glass which opens directly into a large combined living and dining room measuring 25 feet by 13 feet. This room has a beamed ceiling and tapestry brick fireplace and is exceptionally well lighted by ample window space on the side. The kitchen opens directly off the dining room portion and is fitted with built-in cupboards and table and other accessories such as an ironing-board. A back kitchen gives access to the yard and cellar. A breakfast room of ample size is a feature which is especially desirable, with a combined living and dining room such as this house contains, as it may be used as a dining room in the event of the other room being desired exclusively for a living room. It is finished in cream enamel. The ground floor also contains a large bedroom and wash-room.

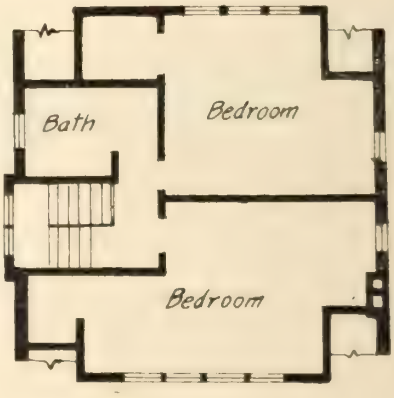
The second floor is divided into two quite large bedrooms with their accompanying clothes closets, and a bathroom. Exceptionally good light is provided for the bedrooms.

The basement is a single open space under the entire area of the house with a fruit storage space and a coal room partitioned off.

The house, which is owned by E. S. Lindabury, 30 Duart Park Road, Toronto, is built of brick and stucco with green shingle roof. The interior trim is either oak or white pine enamelled in cream. H. Addison Johnston, Toronto, is the architect.







Mainly Constructional

East and West—From Coast to Coast

The city council of Brantford is being asked to vote the necessary sums for a new wing and maternity quarters for the Brantford General Hospital.

The permit has been issued for the new building for Trinity College at an estimated cost of $400,000.

A bill has been passed by the United States Senate authorizing the American Niagara Railroad Corporation to construct a bridge across the Niagara River at a point near the City of Tonawanda, N.Y., and passing over Grand Island.

It is reported that Welsh coal mining interests will establish two distributing depots in Montreal and St. John, N.B.

Plans are being prepared for a new church for the North Broadview Presbyterian Congregation, Toronto.

The congregation of St. John's Presbyterian Church, Hamilton, are planning an erection of a $60,000 sunday school.

McIntyre Bros., Peterboro have been awarded the contract for the erection of the new school at Millbrook, Ont.

Plans have been prepared by the Ford Motor Company of Canada for the erection of two buildings at a total cost of $250,000, on Danforth Avenue, Toronto.

The Municipal Health Board of Quebec have been calling tenders for the erection of a disinfecting and sweating plant to be erected on Dorchester Street.

The Runnymede Presbyterian congregation recently passed a resolution favoring the building of a new church. In the same district Victoria Presbyterian congregation proposed the erection of a new sunday school.

It is being usged on the Ontario Government that the road to Loon Lake should be made suitable for automobile traffic during the present summer.

The Quebec Board of Trade are considering the erection of a cold storage plant for the accommodation of perishable goods in transit through the city.

The Fredericton N.B. High School Board are discussing the advisability of constructing an annex to the York Street High School.

The Public Works Department, Ottawa, is asking for the erection of a new departmental office building on Victoria Street, to cost $2,000,000. $400,000 is being asked for immediately.

The Standard Construction Company has started work on a concrete dock at the Fort William elevator. This will replace an old wooden dock.

Building operations involving an expenditure of $50,000 are proposed for the industrial farm at Fort William.

What is considered to be the largest derrick in Canada has been put in operation on the Grand Trunk—Wabash Division, of which Mr. H. W. Matthews is superintendent. The derrick has a capacity of 160 tons and was supplied through F. H. Hopkins and Company by the Industrial Works of Bay City.

The city of Ottawa has adopted certain amendments to the city plumbing by-law as follows: A minimum charge for permits to be made by the plumbing inspectors for plumbing installation and alterations; separate drains for all buildings other than tenement houses which have to have six inch drain pipes; a minimum of four inches diameter for sewer drainage pipes; deep seal traps in the basement of all buildings; no sheet metal piping to be used; plumbers to be responsible for all work performed and not the owners of the building.

Plans for a new industrial Palace building to be erected on the Quebec Provincial Exhibition grounds are now ready for contractors wishing to tender on this work.

The County Council of Grey are considering the advisability of erecting a $60,000 high school at Hanover.

The Windsor Board of Education are agitating for a normal school in that city.

A fire in the Sommerville Hardware Company's property at Edmonton resulted in a loss estimated at $200,000.

Work has been started by the Quebec Development Company on the power development scheme at the Grand Discharge, Lake St. John. This project was described in a recent issue of the Contract Record.

The Westminster presbyterian congregation at Hamilton will erect a new church at the cost of $125,000.

The Provincial Secretary, Toronto, is presenting an appropriation in this year's estimates for a building to be used as an asylum for the insane to replace present inadequate facilities in Toronto.

Estimates of the Toronto Board of Education for 1923 buildings' expenditure are over two million dollars.

Davenport Road Presbyterian congregation, West Toronto, plan the erection of a $10,000 sunday school extension.

It is announced that plans have been completed for the erection of a two million dollar office building in Montreal to be known as the Montreal Insurance Exchange. It is planned to face this building on three streets, St. James, St. Peter and Notre Dame, to be of the arcade type and ten storeys in height.

Works Commissioner Harris, Toronto, presented his estimates to the City's Works Committee, totalling eight million dollars.

Montreal's street paving programme ran somewhat over three million dollars in 1922. The present indications are that the 1923 allotments will at least equal this amount.

The Public Utilities Commissioner of New Toronto urges the expenditure of $40,000 on the town water system extension.

The re-building of the Quebec Basilica on the former lines of architecture has been decided upon. The new building, however, will be fireproof.

The Toronto Public Library Board plan very considerable expenditures in the way of new buildings in the near future.

The City of Hamilton plans the erection of a modern twelve room school to replace the present Victoria Avenue School.

Obituary

J. B. Gratton, founder and president of the contracting firm of J. B. Gratton Limited, Montreal, is dead. Mr. Gratton was born in St. Anne de Plaines, Que., and has been in business in Montreal for thirty years.

Gordon Elmslie, civil engineer, Westmount, Que., is dead in his seventy fourth year. Mr. Elmslie was connected with the Dominion Bridge Company for over thirty years, and later was employed by the Government in connection with the construction of the Quebec Bridge.

Michael Healy, Toronto, a building contractor of Dominion wide reputation is dead in his sixty fourth year. Mr. Healy was born at Smiths Falls and had been a contractor from the age of fifteen.

CONSTRUCTIONAL ACTIVITY

Period of Jan. 31 to Feb. 6, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Algoma District, Ont.
Tenders will be received until Feb. 12 on a roadway and bridge by the Northern Development Branch of the Provincial Government.

Belleville, Ont.
Proposed additions to the waterworks system at a cost of $300,000 include a steel intake pipe, gasoline driven motor supply water main and a water purification plant. Engineers, Gore, Nasmith & Storrie, Toronto.

Brantford, Ont.
Tenders for machinery and equipment for Belleview Pumping Station will be called about Mar. 1. F. Adams, engineer.

Carleton County, Ont.
Roads costing $330,000 contemplated for 1923, by the County Council. Howard Craig, reeve.

Chatham, Ont.
Combined sewers are now being designed for Colborne St., Pegley St., and Park Ave. C. H. R. Fuller, City manager.

City will lay 6 in. watermains on Wilson and Fielder Aves.

Asphalt surfacing on old base of pavements on Park and Dover Sts., will be undertaken, also asphalt pavement on concrete base on several streets.

East Broughton, Que.
Town Council contemplates an aqueduct. Work may proceed this spring. Sec.-treas., J. P. Gasselin.

Edmonton, Alta.
Tenders on cast iron pipe, lead pipe, pig lead, etc., are wanted by the city. Closing date for tenders is Feb. 28. Supt. of Waterworks has the specifications.

Hamilton, Ont.
Plans will be ready shortly and tenders will be called for laying sewers in the McKittrick Survey. E. R. Gray, engineer.

Kingsdale, Ont.
Ellis, Oborn & Ellis, Toronto, will shortly call for tenders for sewers costing $3,000.

Kingston, Ont.
Work will commence at once on a trunk sewer at a cost of $15,000. W. W. Sands, clerk.

Middlesex County, Ont.
Plans are to be prepared for a concrete highway and road improvements. Chas. Talbot, County Bldg., London, engineer.

Montreal, Que.
Extensive paving program contemplated by the City. Rene Bauset, clerk.

Street widening costing about $31,000 contemplated. S. Fortin, engineer.

City Council wants tenders on cast iron pipe and special castings. Tenders will be received until Mar. 2. Rene Bauset, clerk.

North York Twp., Ont.
James, Proctor & Redfern, Toronto, are preparing plans for a $125,000 waterworks plant for the Township Council.

Ottawa, Ont.
Board of Control will receive tenders until Feb. 20 for the following waterworks supplies: Cast iron pipe, pipe castings, valves, lead pipe, pig lead, brass work.

Tenders are wanted by the City of Ottawa until Feb. 20 for the following supplies: Sand, stone, cement, asphalt, asphalt filler, lumber, castings and fuel oil.

City contemplates additional equipment including steel manhole forms and 1,000 ft. of sidewalk forms.

Tenders will be called by the City Council for a large number of water meters. A. F. Macallum, Commissioner of Works.

Sault Ste. Marie, Ont.
Public Utilities Commission contemplate extensions to sewers at a cost of $10,000. W. M. Cornell, Great Northern Rd., manager.

Terrebonne, Que.
Council plans new streets and extensions to others. Tenders will probably be called in the spring. A. L. Beaupre, secretary.

Toronto, Ont.
Removal of the boulevard on St. Clair Ave., contemplated at a cost of $600,000. R. C. Harris, Commissioner of Works.

Commissioner of Works has included in 1923 estimates general roadways, asphalt pavements and concrete sidewalks to the extent of $450,000.

$665,000 is included in the Works Commissioner's 1923 estimates for sewerage disposal work, repairs and relief sewers.

High pressure fire service mains, costing $709,000 are included in the Works Commissioner's estimates.

Waterworks included in the estimates for 1923 total over $2,000,000.

An additional pumping and steam plant and two pumps of 25,000,000 and 80,000,000 gallon capacity are included in the Works Commissioner's estimates for this year.

Whitby, Ont.
Tenders on a slow sand filter and an extension costing $54,000 wanted by the Public Utilities Commission. W. J. Luke, chairman. F. W. Thorold, Admiral Rd., Toronto, engineer.

Winnipeg, Man.
City Clerk will receive tenders on water tube boilers and accessories until Mar. 15.

Railroads, Bridges and Wharves

Middlesex County, Ont.
Report and plans of bridge works to be undertaken this year will shortly be prepared by Chas. Talbot, engineer, County Building, London

Mimico, Ont.
W. B. Redfern, Toronto St., Toronto, engineer, has submitted a report on the building of a subway under the railway track to the Town Council.

Prince George, B. C.
$20,000 warehouse for the Canadian National Rly. will be commenced at once. Owners doing the work by day labor.

Sackville, N. B.
P. J. Veniot, Parliament Buildings, Fredericton, will receive tenders until Feb. 7 for a bridge in Westmoreland Co.

Ste. Croix, Que.
Tenders on an iron bridge to cost $18,000 will be received at the Parliament Buildings until March 14.

Toronto, Ont.
Commissioner of Works has included $1,601,914 in the 1923 estimates for work on bridges. Reconstruction of the Subway at Gerrard & Carlaw is also proposed.

City will received tenders until Feb. 13 for the supply and delivery of field paint for Gerrard St. bridge.

Waterford, N. B.
Tenders on a bridge at Moore's Hill will be received by P. J. Venoit, Minister of Works, until Feb. 14.

Winnipeg, Man.
Tenders will be received until Feb. 10 by District Engineer J. C. Holden, for the construction of the following for the Canadian Pacific Rly: Relaying of pipe lines, section houses, coaling stations and stations.

CONTRACTS AWARDED

Alma, N. B.
The general contract on a bridge to cost $13,000 has been awarded to Allan Construction Co. Ltd., St. Stephen.

Brazeau Subdivision, Alberta.
General contract for the construction of a rock dyke for the Canadian National Rlys., has been awarded to Jamieson Construction Co.

Pollimore, Que.
Councils of Pollimore and Notre Dame de la Selette, have awarded the

general contract for a $10,000 bridge to E. St. Armour, Notre Dame de la Selette.

Fort William, Ont.
Carter, Halls, Aldinger Co. Ltd., have the general contract for freight sheds and docks to cost $120,000, for the C. P. Rly. Prices wanted at once on all subtrades.

Public Buildings, Churches and Schools

Beauharnois, Que.
Plans are being prepared and tenders will probably be called for in the summer for a college costing $100,000. L. C. Tasse, secretary of the School Commission. L. Lemieux, University St., Montreal, architect.

Brantford, Ont.
Tenders for the addition to the collegiate will be called about third week in February. A. K. Brunnell, City Hall, secretary. Architect, F. C. Bodley, Temple Bldg.

Tenders for the $45,000 school in the west end will be called for about the third week in February. F. C. Bodley, architect; Miss Colter, Commercial Chambers, chairman.

Cayuga, Ont.
Haldimand County Council have had sketch plans drawn for a $70,000 court house and jail. H. Arrell, clerk.

Cochrane, Alta.
Tenders will be called for soon by the Beaupre School District for a school building. Address is Secretary-treasurer, Cochrane, Alta.

Delhi, Ont.
Council plans to submit a by-law for $20,000 to provide a Memorial Hall. Reeve, Mr. Aldrich.

Dubuc, Sask.
Plans are being prepared by the school board for an addition to the school. Tenders will be called for in March. Storey, Van Edgmond, Regina, architects.

Esquimalt, B. C.
Dominion Government contemplates alterations to a hospital. William Henderson, Post Office, Victoria, architect.

Fairbank, Ont.
New church and Sunday school contemplated by St. Hilda's congregation. Rev. H. R. Young, rector.

Fredericton, N. B.
An Agricultural school costing $20,000—$25,000 contemplated but has not yet been approved by the Government. Hon. D. W. Mersereau, Minister of Agriculture.

Gosfield South Twp., Ont.
Tenders for a school will be received until Feb. 10. Alvin Wright, R.R. No. 2, Kingsville, secretary.

Hamilton, Ont.
Work will start this year on a Sunday school for St. John's Presbyterian Church. Building will cost about $60,000. Warren & McDonnell, Home Bank Bldg., architects.

Immigration Home contemplated by the Dominion Government. W. G. Marritt, Dundurn St., local representative.

Lemonville, Ont.
Public School Board contemplates a school. Stanley Hastings, R.R. No. 2 Stouffville is sec.-treas. Work will commence about Apr. 1.

London, Ont.
Question of building a $500,000 seminary will be discussed again this year. Bishop Fallon, London, has the plans.

Luseland, Sask.
The School Board will receive tenders until Feb. 17 for work on a schoolhouse. K. W. Sterzer, Luseland, sec.-treas.

Merriton, Ont.
Bulk and separate tenders for a school costing $10,000 will be received by Nicholson & Macbeth, architects, St. Catharines. R. Clark, clerk.

Mille Vaches, Que.
Tenders may be called this spring for finishing the interior of a church. Rev. Thos. Dufore is the parish priest.

Milverton, Ont.
Plans are to be prepared for a four room continuation school. Chairman of the School Board is N. H. Hondrich. Cost estimated at $25,000.

Moncton, N. B.
R. A. Frechette, Bonnacord St., St. John, has prepared plans for a $150,000 school for the Catholic School Board. Bishop of St. John, interested.

Montreal, Que.
Tetraultville Presbyterian Church contemplates proceeding with an addition to the building this year.

Salvation Army, Canadian Headquarters, Toronto, contemplate a $200,000 hospital. Brig. Jennings is in charge of the property department.

New Toronto, Ont.
Plans are being prepared for an addition to the school at a cost of $35,000. Smith & Wright, Toronto, architcets.

Ottawa, Ont.
Tenders for the balance of the work on the hospital will be called for about the end of February. N. H. H. Lett, clerk.

Pitt Meadows, B. C.
School Board will commence work at once on a schoolhouse to cost $4,500. Henry Whittaker, Victoria, architect. H. W. Harrison, is the general contractor.

Prince Rupert, B. C.
Alterations to the Public library to the extent of $4,500 will be commenced at once. F. T. Whittaker is the architect and J. McKechnie is general contractor.

Prince Albert, Sask.
Plans for a $75,000 addition to Holy Family Hospital are being prepared. J. P. O'Leary, Regina, Sask., will handle the general contract.

Province of Ontario.
A new asylum for the insane will be provided for in the estimates this year. Location has not been decided on. H. F. McNaughton, Parliament Buildings, Toronto, secretary.

St. Arsene, Que.
J. W. Roy secretary of Board which contemplates a school.

St. Christophe, Que.
School is contemplated. L. R. Garneau, secretary of the Board.

St. Come, Que.
Board contemplates a schoolhouse. G. Rheaume, St. Come, secretary.

St. Jules, Que.
Board contemplates a school. E. J. Foran, secretary.

Toronto, Ont.
A syndicate has had plans drawn for a recreation club to cost $95,000. President, Dr. E. Humphreys, Danforth Ave. C. Johns, 1657 Dufferin St., in charge of construction.

Molesworth, West & Secord, Victoria St., are preparing plans for a Sunday School for Victoria Presbyterian Church. Cost will be about $40,000.

Tenders on St. Clair Ave. Methodist Church will be called by the architects, Wickson & Gregg, Temple Bldg., early in the spring.

St. Ann's Anglican Church contemplates redecorating the church in June. Rev. L. E. Skey, Dufferin St., rector.

Alterations to Dovercourt Presbyterian Church contemplated at a cost of $20,000. Architect not yet appointed.

Sketch plans have been prepared for a Parish Hall for St. Matthais' Anglican Church. Wrecking the present Parish House and replacing it with a new building is contemplated this year. J. O. Elton, Palmerston Gdns. Chairman of Building Committee.

Uxbridge, Ont.
Bulk and separate tenders are being received until Feb. 21 for $75,000 school. D. R. Franklin, Toronto, architect.

Usk, B. C.
Provincial Government is having plans prepared for a school to cost $6,000.

Welland, Ont.
Board contemplates a Memorial Hospital at a cost of $150,000. W. J. Hickey, Main St., E., chairman.

Windsor Mills, Que.
N. Rousseau is secretary of the Board which proposes to build a new school. J. W. Gregorie, Sherbrooke, architect.

CONTRACTS AWARDED

Ottawa, Ont.
Iron work contract for branch of the Bank of Commerce awarded to Ottawa Iron Works, Nelson St. McKinley & Northwood, Rideau St., have the contracts for roofing and galvanized iron, copper, etc.

Preston, Ont.
Knowles Electric Co., Talbot St., has the contract for electric wiring of Preston Sanitarium.

Toronto, Ont.
Rilett Bros., Confederation Life Bldg., Toronto, have the contract for excavating for repair shop and storehouse for T. T. Co. The steel contract has been awarded to the Dominion Bridge Co.

Cut Stone contract for Victoria Skating Club has been awarded to Nicholson & Curtiss, Yonge St.

Waterloo, Ont.
Kertzel Bros., Waterloo, Ont., have the general contract for a school costing $101,000.

Business Buildings and Industrial Plants

Asbestos, Que.
Canadian John Manville Co. Ltd., Montreal, propose to build a manufacturing plant. Plans will be prepared by the owner's staff. J. R. Pearson, Asbestos, vice-president.

East Broughton, Que.
Work is in progress on alterations to the plant of the Quebec Asbestos Co., costing $80,000. H. William is the supervisor and buyer.

Harrow, Ont.
Plans for a general store costing $10,000 are being prepared for Simon Bolus.

Building and equipping a butter making and cold storage plant contemplated by P. W. Armstrong. Interested in prices of all equipment.

Lake Kathlyn, B. C.
Booth Fisheries Ltd., Prince Rupert, will commence work at once on an ice stroage plant at a cost of $7,600. R. C. Mutch has the general contract.

London, Ont.
In addition to three residences planned at a cost of $7,500 each, J. Gould, Partridge St., will prepare plans for a store and residence costing $8,000.

Tenders are open for a $10,000 storage building for the Ruggles Motor Car Co. No closing date set.

Z. Trudeau, Marlow Ave., contemplates store and flats. R. Charbonneau, architect.

Eleven storey building contemplated. Owners name withheld. Further particulars may be had from MacLean Reports Ltd., Montreal.

G. V. Green, Sherbrook St., contemplates a garage and may proceed with the work shortly.

Tenders are wanted on Plate Glass for the addition to store owned by Morgan Realties Ltd. General contractor is Henry Morgan & Co. Ltd., Beaver Hall Hill.

Montreal, Que.
An office building 10 storeys high costing $3,000,000 is contemplated by Insurance Corporation, Ltd. D. J. Spence, Beaver Hall Hill, architect.

Moose Jaw, Sask.
M. Weiss, Pense, Sask. will, build a $5,000 service station in the spring. Fittings required.

Ottawa, Ont.
As soon as weather permits Alderman Fred Hunt will commence work on a building containing 3 stores and 12 apartments, on Bank St.

Chas. R. Stephens, is having plans prepared for a business block.

Province of Quebec.
Laurentide Air Service, Montreal, contemplate an aircraft plant but have not decided on a location.

St. Catharines, Ont.
Plans for a skating rink and ice plant are being prepared. H. J. McAvoy, Gerrard St., interested.

Sarnia, Ont.
Dominion Alloy Steel Corporation, Toronto, has decided to erect a plant costing $5,000,000.

Straffordville, Ont.
Plans are being prepared and tenders will be called about April 1 on a milk receiving station for the City Dairy Co., Toronto. Gore, Nasmith & Storrie, Toronto, architects.

Toronto, Ont.
Ellis, Osborn & Ellis, Dineen Bldg., are preparing plans for a warehouse to cost about $15,000.

Tenders will be called for shortly for an addition to the store of Robert Simpson Co. Ltd. Horwood & White, Ryrie Buiding, architects.

An office building costing $20,000 is contemplated by C. Johns, Dufferin St. Oborn & Ellis, Dineen Bldg., are preparing the plans.

J. E. Wainwright, Kent Rd., contemplates ten stores. Work will proceed in the spring.

This spring J. R. Gifford, Danforth Ave., will commence work on five stores with apartments above.

G. Boukydis contemplates altering a store on Yonge St., into a cafeteria. N. A. Armstrong, King St. E., architect.

Plans for a factory building are being prepared by D. H. Burnham, Lauder Ave. Work may start in the spring.

Pearcy Breakey, 402 Yonge St., is receiving tenders on alterations to a building.

Two stores and apartments costing $6,000 will be built by C. Dawson, 2454 Yonge St.

Wasaga Beach, Ont.
Tenders wanted until Feb. 9 on an addition to tea rooms. D. A. McLean, owner. J. Wilson, Collingwood, architect.

CONTRACTS AWARDED

Ford, Ont.
Masonry contract for machine shop and garage for Merlo, Merlo & Ray, has been awarded to Wm. Bourtleski, Moy Ave.

Montreal, Que.
Alterations to the extent of $8,000 are being made to the Windsor Hotel, Peel St. P. Lyall & Sons, Construction Co. Ltd., are the general contractors.

Brick contract for a $16,000 store awarded to Ovide D'Armour, St. Andre St. Plastering contract awarded to J. Brousseau, St. Andre St. Brenier & Boucher, St. James St., owners.

Alcide Chausse, Notre Dame St. W., prepared the plans for stores and flats under construction for Dr. J. O. Handfield. Brick contract has been awarded to A. Bertrand, St. Dominique.

Toronto, Ont.
Toronto Steel Construction Co. Ltd., King St. E., has the contract for steel for the $20,000 gearage being built by A. E. Burton, Danforth Ave.

W. Mitchell, Danforth Ave., has the electrical contracts for stores and apartments being built by Grimshaw Bros., at a cost of $40,000.

Contract for masonry in the alteration and addition to the Orange Crush Bottling plant awarded to H. N. Dancy & Son Ltd. Dominion Bridge Co. has the steel contract.

Albert Venn, Palmerston Sq., has the masonry contract and G. Sparling, Dundurn Ave. the carpentry contract for a factory for Gabriel Mfg. Co., Front St.

Roofing contract for the addition to the factory of the National Brass & Aluminium Co., St. Patrick St., has been awarded to E. Lankin & Son, Lippincott St.

Metropolitan Glass Co., Victoria St., has the glazing contract for a store and office building. Painting contract let to J. H. Proctor, Dufferin St. E. E. Rutherford, King St. W., owner.

Vancouver, B. C.
Contracts for reinforcing and steel for an addition to an apartment store costing $115,000 awarded to Evans, Coleman & Evans and Balfour, Guthrie & Co.

Windsor, Ont.
C. A. Thibodeau, Bruce St., has the electrical contract for a block of stores. Baxter Hardware Co., Pitt St. E., are the owners and builders.

Canadian Bridge Co., has the contract for structural steel in the rebuilding of a business at a cost of $25,000.

Residences

Aylmer, Ont.
Harry L. Paupst, Aylmer, is having plans prepared for a residence costing $4,000.

Hamilton, Ont.
M. H. Bull & Oxford, Balmoral Ave., are building two cottages costing $5,000.

J. A. Patterson, Beach Blvd., will commence work on a resiednce this spring.

Kitchener, Ont.
Tenders on a $9,000 residence for Stanley Shupe, Queen St., will be called for about Mar. 1. Architect, W. H. E. Schamltz.

About Feb. 20 tenders will be called for on a duplex desidence costing $10,000. Chas. Knechtel, Courtland St., architect.

Kingston, Ont.
Tenders will be called for next month for a residence costing $14,000. D. M. Chown, owner and architect.

London, Ont.
Plans are drawn and Dr. Babb, Waterloo St., contemplates proceeding with a $20,000 residence this spring.

Montreal, Que.
Twelve flats planned by J. H. Dmers, Sherbrooke St., at a cost of $40,000.

O. Labelle, Northcliffe Ave., is building a residence costing $7,000.

Work will commence shortly on an $8,000 residence. Geo. Lapointe, Rivard St., owner and builder.

Oakville, Ont.
R. W. Catto, King St. W., Toronto, is preparing plans for alterations and additions to a country house on the highway near Oakville. H. B. Purckett, owner.

Point Grey, B. C.
C. J. Phillips Vancouver, will com-

mence work at once on a residence to cost about $9,500.

A $7,000 residence is contemplated by Thomas Oliver.

The walls are going up for 3 residences costing $13,500. J. W. Darcy, Vancouver, owner. Rodger Contracting Co., Vancouver, general contractors.

J. C. Neff, Vancouver, will build a residence costing $5,000.

Quebec, Que.
Work is in progress on a $5,000 residence. L. Tanguay, Bigaouette St., owner.

A. Rawland, DeSalaberry Ave., is building a residence costing $9,000.

St. Catharines, Ont.
R. J. Magness, Church St., is having the plans for a $9,000 residence prepared.

J. W. Peart, Queen St., will have plans prepared for a $6,000 residence.

St. Mary's, Ont.
The Presbyterian Church contemplates the building of a manse, also church stables and a gymnasium. Rev. Chas. Evans, pastor.

Sydney, N. S.
D. P. McDonald, Esplanade, contemplates a residence at a cost of $6,500.

Toronto, Ont.
Work on a $12,000 residence for H. Hutson, Victoria St., will commence shortly. J. Hunt Stanford & Son, Yonge St. Arcade, architects.

W. Rayfield, Church St., contemplates seven or eight residences this spring.

Plans for 2 detached resdences costing $15,000 are being drawn by J. Hunt Stanford & Son, for H. Powell, Indian Trail. Owner will let all trades.

J. Carr Oakdene Cresc., has the foundations in for a pair of residences costing $8,000.

Six residences are contemplated this spring at a cost of $4,000 each by Branson & Taylor.

A. Edmonds, Thome Cres. is having plans prepared for a duplex house.

Plans for a $9,000 residence for Mrs. W. G. Atkinson, Prince Arthur Ave., are being prepared by J. Hunt Stanford & Son, Yonge St. Arcade.

Work will start shortly on two residences costing $7,500 each. W. Richardson, Armadale Ave., is the owner and builder.

J. Hunt Stanford & Son, Yonge St. Arcade, have drawn plans for a $15,000 residence for Mrs. Boy, 411 Danforth Ave.

Hubbs & Hubbs, Victoria St., contemplate 2 pair of residences costing $15,000.

Plans have been prepared by W G. Hunt, Confederation Life Bldg., for a $5,000 residence. J. Chapple is the owner and builder.

P. Corking, Monarch Pk. Ave., will call for tenders shortly for the painting, wiring, plumbing, heating and plastering of two residences costing $10,000 each.

Four detached residences costing $5,000 each will be commenced shortly by E. Grainger, Yonge St.

R. & G. Glover, Bartlett Ave., have secured the sites for two residences in the Runnymede district.

Site for residence secured by Frank Taylor, Willard Ave., and work will probably proceed in April.

W. Richardson, Armadale Ave., contemplates four or five residences this spring.

About the end of February tenders will be called on a residence costing $15,000. Page & Warrington, Confederation Life Bldg., architect.

A. H. Lightfoot, Morley Ave., is excavating for a residence to cost $4,000.

Four residences and five bungalows costing $3,000 each are contemplated by W. W. Hiltz, Danforth Ave.

Frank E. Read, Scarboro Rd., is excavating for 4 pair of residences costing $6,000 a pair.

Victoria, B. C.
A residence costing $3,000 being built by E. Trick, Wilmer St.

Waterloo, Ont.
Paul Bergman, King St., has the foundations in for a $6,000 house.

W. H. E. Schmaltz, architect, Kitchener, will call tenders on a $6,000 residence for S. Pauli, Kitchener, about Feb. 15.

Weston, Ont.
Plans are drawn for a $9,000 residence. General contract will probably be awarded to Clayton Bros.

Plans for a duplex residence for F. Brown being prepared by J. Hunt Stanford, Toronto.

CONTRACTS AWARDED

Montreal, Que.
Contracts on 21 of the 200 residences being built by the Corporation des Lodgements Ouvriers, St. Catherine St., are awarded as follows: Electrical, W. Cousineau, Notre Dame W.; plastering, T. Bibeau Fils, Chambord St.; sash and doors, H. Brosseau, Sorel, Que.

Contracts on two residences costing $16,000 have been awarded as follows: Brick, D. Verville; roofing, E. Chapange; elecerical, O. Taubert; plumbing, J. O. Leduc; plastering, Gerrard & Gerrard; sash and doors, Millen & Freres.

P. Perron, 1st Ave., has awarded contracts on two residences costing $15,000 as follows: Roofing, J. Lamarche; electrical, N. Romeo; plumbing, M. Fourcreault; plastering, J. Tremblay; sash & doors, L. Desmarais, Warwick, Que.

J. H. Clarke, c/o general contractors, has the plastering contract for a $19,200 residence being built for W. G. Brown, St. James St. by Fussing & Jorgensen.

T. Frenette, Garnier St., has the contract for brick for two residences costing $25,000. Electrical contract has been awarded to R. Chamberland, Gernier Ave. and the painting contract to T. X. Renaud, Esplanade St.

Toronto, Ont.
Contracts on six pairs of residences costing $7,000 each have been awarded as follows: Plastering, Simpson & Bracy; electrical, Mr. Farley; plumbing, A. J. Wise; heating, Pease Furnace Co.

Walls are going up for an $8,000 house, G. S. Stocker, Brownlow Ave., builder. The masonry contract has been awarded to W. Davis, Dunfield Ave.

Wateloo, Ont.
Plumbing and heating contract for a $15,000 residence for A. P. Learn, King St., awarded to Harvey Gleiser, Waterloo.

Windsor, Ont.
Pennington & Laing, Caron Ave., have the roofing contract and G. H. Duncan, Maranette St., the electrical contract for a residence costing $32,500. C. S. King, Gas Bldg., Chatham, owner.

Power Plants Electricity and Telephones

Bagotville, Ont.
Town Council has to vote a regulation of loan for construction of $150,000 power plant. Tenders will be called as soon as it is negotiated.

Lake Kenogami, Que.
Tenders on the $1,800,000 storage dams are being received until Feb. 20. O. Lefevbre, Quebec Streams Commission, Montreal, engineer.

Monkton, Ont.
Village Council will secure estimates on cost of a hydro electric system, as soon as possible.

Petrolia, Ont.
Motors and general electrical supplies for the sugar refinery built by Peninsula Sugar Co. not yet purchased. Building materials for a dam also needed.

St. John, N. B.
Tenders will be received until Jan. 29 by Civic Hydro Commission, City Hall, for switching equipment for the $100,000 sub-station. Tenders for the building are open until Jan. 30.

Miscellaneous

Almonte, Ont.
North Lanark Poultry Association contemplates the purchase of 300 steel exhibition coops. A. C. Bond, secretary.

Brantford, Ont.
A. Livingston, architect, formerly associated with F. C. Bodley, has opened offices in Lansdowne Park.

Collingwood, Ont.
Council contemplate the purchase of additional fire apparatus including fire alarm boxes, motor generator set and storage batteries, visual indicators, hydrants, motor truck, cellar nozzle and hose.

Essondale, B. C.
Plans for a heating plant for the Sanitarium Buildings are being prepared. Henry Whittaker, Parliament Buildings, Victoria, architect.

Glenwilliams, Ont.
Hugh Logan has taken over the business of the Terra Cotta Brick Co. and will open for business in April. In the market for $2,000 worth of belting.

Losh Alsh District, Ont.
Extensive mine developments contemplated by Goudreau Utica Development Co. Ltd., New York, in the spring. S. Rosentein, East St., is the local representative.

Montreal, Que.
Prices on puncher, planer, circular saws and eight lath machines wanted by P. Dupny, St. Timothee St.

Ottawa, Ont.
Tenders will be called for a large

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

Tenders Wanted

Tenders for the Erection of a One Storey and Basement Four Roomed Public School in the Town of Newmarket, Ontario

General Tenders wanted to include Sewer, Excavation, Masonry, Reinforced Concrete, Brickwork, Hollow Tile, Cut Stone, Structural Steel, Carpentry, Joiner work, Steel windows, Glazing, Painting, Felt and gravel roofing and sheet metal work, Plastering, Terrazzo flooring, Plumbing.

Scaled lump sum Tenders marked "Tender for Newmarket School" to be mailed to the Architect not later than **Saturday evening 17th., February 1923**.

Plans and specifications may be seen at the Builders Exchange, Bond St., Toronto.

Also at the office of the Architect, Newmarket. Ont.

6-7 O. E. TENCH, Architect.

RATES

20 cents per agate line (14 lines to the inch) Positions Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

CONTRACTORS

Tenders will be received by the undersigned until **February 14th.**, for the various trades required in the erection of

St. John's Church

corner of Humberside and Quebec Avenues, Toronto.

GORDON & HELLIWELL, Architects,
526 Confederation Life Building, Toronto.

5-6

DIRECT CURRENT MOTORS

Kingston Penitentiary

Sealed tenders addressed to, "The Superintendent of Penitentiaries, Ottawa," and endorsed, "Tender for Motors" will be received until

Wednesday, February 28, 1923,

from the parties desiring to purchase any or all of the following electric motors:—

No.	H.P.	Volts	Revolutions	Manufacturer
1	10	110	850. R.P.M.	Dick Kerr Mfg. Co.
1	15	110	960 R.P.M.	Dick Kerr Mfg. Co.
1	1	110	1725 R.P.M.	Sprague Electric Co.
1	10	110	1100 R.P.M.	Peerless Motor Co. (direct connected to fan)
1	10	110	850 R.P.M.	Dick Kerr Mfg. Co.
1	10	110	850 R.P.M.	Dick Kerr Mfg. Co.
1	5	110	(650 to 1500 R.P.M.)	Westinghouse, no base.
1	35	110	1800 R.P.M.	Westinghouse, no base.
1	3	110	1650 R.P.M.	Jones and Moore.
1	3	110	1100 R.P.M.	General Electric Co.
1	10	110	1400 R.P.M.	General Electric Co.
1	15	110	1150 R.P.M.	General Electric Co.
1	30	110	Variable	Westinghouse, (Grids and Controller)
1	10	110	Variable	Westinghouse.
1	1	110		Westinghouse

(Armature will require to be rewound)

Starters Supplied With All Motors

The above mentioned are in good repair and may be viewed at the Kingston Penitentiary, Kingston. Ont.

Terms of sale—cash.

Motors to be removed from the Penitentiary before March 20, 1923.

Papers inserting this notice without authority from the King's Printer, will not be paid therefor.

(Signed) W. St. PIERRE HUGHES, D.S.O.
Superintendent of Penitentiaries

Department of Justice,

5-6

Tenders for School

Bulk tenders only, will be received by Edward Dehler Esq., Secretary, Separate School Board, Waterloo, Ont., until

February 28th, 1923

for all trades required in the erection of addition to school building at Waterloo, Ont.

Tenders to be sent by registered mail only.

Plans and specifications may be seen at the office of Edward Dehler, Waterloo, Ont., or at the office of the undersigned. A deposit of ten dollars, returnable, will be required on all plans.

The lowest or any tender not necessarily accepted.

J. M. COWAN, Architect,
6-7 991 Bay Street, Toronto.

The Quebec Streams Commission

Proposed Storage Dams at Lake Kenogami

Notice to Contractors

SEALED TENDERS addressed to the undersigned and marked "Tenders for Storage Dams at Lake Kenogami" shall be received at the office of The Quebec Streams Commission, Parliament Buildings, Quebec, until Twelve o'clock, on

Tuesday, the 20th of February 1923.

Plans and specifications can be seen on or after this date at the office of the Commission, 59 Notre Dame Street East, Montreal.

Parties tendering shall be required to accept the fair wages schedule prepared or to be prepared by the Department of Labor of the Province of Quebec, which schedule shall form part of the contract.

Tenderers are notified that tenders shall not be considered unless made strictly in accordance with the printed forms.

An accepted bank cheque for the sum of One Hundred and Fifty Thousand Dollars ($150,000.00) made payable to the order of the Provincial Treasurer, must accompany each tender, which sum shall be forfeited if the party tendering declines entering into contract for the work, at the rates stated in the offer submitted. The cheque of the successful tenderer shall be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By Order
O. LEFEBVRE, Chief Engineer,
The Quebec Streams Commission,
59 Notre Dame Street, East,
Montreal, Jan. 22nd, 1923.

Newspapers inserting this advertisement without authority from the Commission will not be paid for it. 5-7

QUANTITY SURVEYOR Fully qualified in all branches of the profession open for engagement. Apply Box 120, Contract Record, Toronto.
6-9

TENDERS

Water Filtration System

Town of Whitby

Tenders will be received by the Public Utility Commission of the Town of Whitby, up to 3.00 P.M. Thursday, February 22nd, 1923, for the various parts of the work and materials required in the construction of a system of Slow Sand Filters for the Town.

Contract "A" Construction of concrete filters including excavation, cement steel, concrete and pipelaying.
Contract "B" Supply of Cast Iron Pipe and specials.
Contract "C" Supply of Gate Valves, Foot Valves, Valve Boxes, etc.
Contract "D" Supply of Tile Pipe and Junctions.
Contract "E" Centrifugal Pumps, Motors, Gasoline Engine, etc.

Full particulars may be obtained from the Engineers.

W. J. LUKE, Chairman,
Public Utility Commission,
Whitby, Ont.
GEO. W. P. EVERY, Secretary,
Public Utility Commission,
Whitby, Ont.
F. W. THOROLD CO. LIMITED,
Consulting Engineers,
54 Admiral Road, Toronto.
Phone Hillcrest 5545

5-6

ONTARIO

Notice to Contractors

Tenders will be received by the undersigned up till noon on

Monday the 12th day of February, 1923,

for

1. The construction of an embankment across that part of the St. Mary's River lying between Broken Section O of the Township of Laird, District of Algoma and Pine Island, and
2. The Construction of re-inforced concrete launch opening in the said embankment.

The site of the proposed work is approximately eleven miles south of the Village of Echo Bay.

Plans and specifications may be seen and forms of tender obtained at the offices of this Branch situated at Sault Ste Marie and Gore Bay or at the office of the undersigned.

A marked cheque for ten per cent (10%) of the amount of the contract must accompany each tender.

Contracts for the embankment and launch opening may be awarded separately or together, but tenders must be submitted separately.

The lowest or any tender not necessarily accepted.

C. H. FULLERTON,
Director,
Northern Development Branch,
Parliament Buildings,
Toronto, Ont.
22nd of January, 1923. 5-6

RELIABLE YOUNG MAN—would like to get agency from wholesale lumber concern, to sell in Nova Scotia and Newfoundland on commission. Have had fourteen years experience in building and handling lumber. Can furnish references. Box 122, Contract Record, Toronto. 6-7

Notice to Contractors

CIVIC SUPPLIES

Sealed Tenders addressed to the Chairman and Members of the Board of Control, City Hall, Ottawa, will be received by the Secretary of the Board of Control, City Hall, Ottawa, up to 12 noon,

Tuesday, February 20th, 1923,

endorsed "Tender for Asphalt, Asphalt Filler, Brasswork, Broken Stone, Castings, Cast Iron Pipe, Cement, Draughting Supplies, Lead Pipe, Pig Lead, Plank and Cedar, Sand, Service Posts, Special Pipe Castings, Valves, Vitrified Clay or Cement Sewer pipe, Road Oils, Fuel Oil, Refined Tar, or Meters," as the case may be.

Specifications, form of tender and full particulars may be obtained on application at the City Engineer's Office, City Hall, Ottawa.

Any tender received after the above stated time will be declared informal.

The Corporation does not bind itself to accept the lowest or any tender.

A. F. MACALLUM,
Commissioner of Works.
Ottawa, February 2nd, 1923. 6

FOR SALE

Electric Travelling Cranes and Steel Crane Runways

STEEL CRANE RUNWAY—382 ft. long; height of columns 30 ft.; weight about 150 tons. Used for 15-ton Crane 80 ft. span.

1—CLEVELAND ELECTRIC TRAVELLING CRANE 80 ft. span; capacity 15 tons. At present in service on the above Runway.

STEEL CRANE RUNWAY—220 ft. long; height of columns 23 ft. Also 22 additional Girders each 20 ft., without columns, sufficient to extend Runway 220 feet additional. Total weight about 50 tons. Used for 7½-ton Crane 70 ft. span.

2—CLEVELAND ELECTRIC TRAVELLING CRANES—37 ft. span; one 15-ton capacity, and one 10-ton capacity, without Electrical Equipment.

Ask for prices and further particulars, also a complete list of our second hand machinery.

The Maritime Bridge Co., Limited
New Glasgow, Nova Scotia

6 T.f

A Service to the Profession

Every man wishing to tender must first see the plans and specifications.

If the plans are in Montreal and he is in Vancouver the inspection is a problem. We, however, with your assistance, are able to solve it. Place them on file at any or all of the offices of the "Contract Record" throughout the Dominion.

Contractors, engineers and allied manufacturers read the "Contract Record." It is the logical publicity medium for the announcement of tenders wanted.

Send us your plans. They will receive the best of care.

A room is reserved in each of our offices for examination of your plans by possible bidders.

Contract Record

and Engineering Review

Toronto - - - 345 Adelaide St., W.
Montreal - - 119 Board of Trade Bldg.
Winnipeg - - - 302 Travellers' Bdg.
Vancouver - - - 106 Winch Bldg.

TENDERS

Sealed bulk and separate tenders, addressed to T. F. Thompson, Secretary Board of Education, Uxbridge, Ontario, endorsed with the word "Tender," will be received until February 21st, 1923, for all trades in the erection of the new

Uxbridge High School, Uxbridge, Ontario.

Tenders must be in the hands of the Secretary not later than 4 o'clock p.m. on the day named, after which no tender will be received.

The lowest or any tender will not necessarily be accepted.

Plans and specifications may be seen and all information obtained at the office of the Architect, D. R. Franklin, 587½ Yonge Street, Toronto. Dr. F. E. Mellow, Chairman of Committee. 6

Teams Wanted

200,000 cubic yards of scraper work to start in Spring, will let contracts and will hire teams. Apply G. L. Campbell, Thorold, Ont. 6

FOR SALE

One—6 x 8 double drum Contractor's hoist with boiler, in good condition.
THE HALL MACHINERY CO.,
6 Sherbrooke, Que.

CRANE FOR SALE

Byers Steam, Model No. 3 Auto Crane, suitable for coal or builders' supply yard, on road wheels, completely housed in corrugated iron, equipped with water tank, 38′ boom swinging 180 degrees, half-yard Williams clamshell, capacity over 300 cubic yards gravel per day. Open for inspection at Windsor, Ont. For full specifications and price apply to Cadwell Sand & Gravel Co. Ltd., Windsor, Ont. 6

STEEL PILING

1000 tons 40′ long.
14″ x ⅜″ Arch Web.
7″ x ¼″ Straight Web.
All ready to load.
UNIVERSAL EQUIPMENT COMPANY,
1 T.f. Niagara Falls, Ont.

FOR SALE

Keystone Excavating Machine, complete with two sticks, skimmer scoop, and three ditching scoops; this machine has been used only one season and is guaranteed to be in first class condition. Price $4,500 f.o.b. St. John, N. B.

Austin Backfiller with caterpillar traction, 4-cylinder Buffalo engine, in equally good condition. Price $2,500 f.o.b. St. John, N. B. Canada Lock Joint Pipe Limited, 65 Pleasant Boulevard, Toronto, Ont.; or St. John, N. B. 6-T.f.

POSITION WANTED—Civil Engineering Graduate, with experience covering draughting, instrument man, concrete inspection, cost and timekeeping, desires position with engineering or contracting concern. Excellent references. Box 124, Contract Record, Toronto. 6-7

Wanted—thoroughly experienced crushed limestone quarry superintendent, familiar with handling steam shovels, well drills, pulverizers, etc., economically. Must be sober, steady and honest with good references. Otherwise do not apply. Address Miner Company Limited, 207 St. James St., Montreal. 6

quantity of refined tar. A. F. Macallum, Commissioner of works.

The purchase of asphalt equipment is contemplated by the City Council. C. F. McCallum, Commissioner of Works.

Peterboro, Ont.
Plankstone Co. of Canada Ltd., recently incorporated with a capital of $200,000 will carry on general construction business. G. A. Gillespie, Homewood Ave., and P. P. Westbye, Dennistown Ave., interested.

Sombra Twp., Ont.
Town Council contemplates having Marsley Creek dredged. W. A. Scott, Wilkesport, Ont., clerk.

Tobique Narrows, N. B.
Tenders are being received until Jan. 31 for lumber for the Tobique Narrows Bridge. P. J. Veniot, Fredericton, Minister of Works.

Toronto, Ont.
City of Toronto wants tenders on the following supplies: Treated wood blocks, portland cement, mineral dust or filler, gravel, iron & steel, house numbers, sand, rubble stone.

J. M. Cowan, architect, whose office was formerly 107 St. Vincent St. is now 991 Bay St., due to the change in name and the re-numbering of the street.

Tenders for valves are open until March 6. Specifications are at the City Hall.

CONTRACTS AWARDED

Oakville, Ont.
B. E. Sproul has the electrical contract and H. S. Wilson has the plumbing contract for $25,000 arena and stable being built for H. C. Cox.

Toronto, Ont.
Canada Crushed Stone Co., Dundas, Ont., has been awarded a contract for crushed stone by the Provincial Government.

Fires

Bagotville, Que.
Store and residence owned by T. Berube, of Port Alfred were destroyed by fire at a loss of $8,000.

Hull, Que.
J. B. Harper, Delorimer St. owner of the sash and door factory destroyed by fire at a loss of $10,000.

Lachine, Ont.
Boat house owned by H. Leblanc destroyed by fire. Loss about $35,000. Owner is undecided about rebuilding.

London, Ont.
Building owned by J. E. Stevenson, Dufferin St., completely destroyed by fire at a loss of $10,000.

Children's Shelter destroyed. Loss estimated at $30,000. Owners will rebuild. W. E. Kelly, Ridout St., superintendent.

Plant owned by the Ruggles Motor Co. damaged by fire to the extent of $10,000.

Montreal, Que.
$10,000 loss when fire destroyed residence owned by A. Bertrand, Beauport, Que.

St. Adrien de Ham, Que.
Herbert Valliers & Son suffered a $10,000 loss when their sawmill was destroyed by fire.

Ste. Agathe, Que.
Store and residence owned by Martel & Freres was destroyed by fire at a loss of $15,000.

Late News

Montreal, Que.
A tunnell on Sherbrooke St., costing $45,000, contemplated by the city. S. Fortin, engineer.

Moose Jaw, Sask.
The Sisters of Convent of Sion contemplate a college at a cost of $30,000.

Newmarket, Ont.
Bulk tenders are being received until Feb. 17 on the proposed $54,000 addition to a school by O. E. Tench, architect.

North Vancouver, B. C.
Work will start shortly on a $35,000 wharf for the Vancouver Pile Driving Co. D. King, manager.

Oakville, Ont.
Molesworth, West & Secord, Victoria St., Toronto, are preparing plans for a Sunday School to cost $30,000.

Ottawa, Ont.
Ottawa Suburban Roads Commission has had plans prepared for the following work: Bowiesville Rd., 1½ miles of asphalt at a cost of $35,000; Merrivale Rd., ¾ mile asphalt costing $15,000 and Metcalfe, 2 miles of asphalt costing $40,000

Penetanguishene, Ont.
Re-inforced concrete pavement, costing $21,550, contemplated by the Town Council.

St. Vital, Man.
Plans are being prepared for an addition to the school at a cost of $60,000. John Godwin, St. Vital, secretary.

Tavistock, Ont.
The Agricultural Society will secure estimates on a building that may be used as an exhibition building and a skating rink. President, Dr. P. Harold.

Vancouver, B. C.
Three public comfort stations costing $18,000 each proposed by the city. Wm. McQueen, clerk. A. J. Bird, architect.

Verdun, Que.
J. Soucesse, Wellington St., has general contract for twelve flats costing $35,000 for I. Prefontaine, St. James St. General contractor will let sub-trades.

Victoria, B. C.
Ancient Order Foresters contemplate a lodge building at a cost of $30,000. Plans will be prepared and tenders called almost immediately. Arthur Mason, secretary.

The general contract for a building for the Bank of Montreal has been awarded to Luney Bros Ltd., Saywrad Bldg., at a cost of $130,000.

Waldo, B. C.
General contract for a $39,000 timber bridge on concrete abutments has been awarded to Wm. Greenlee, Seymour St., Vancouver.

Willow River, B. C.
Provincial Government will commence work at once on a bridge costing $22,000. Hon. W. Sutherland, superintendent, Henry Whittaker, Victoria, architect.

THIS COMPANY has been writing Bonds for contractors over a period of eighteen years, and is naturally in a position to properly look after your requirements. Our knowledge of rates and proper rebates to be allowed is at your service. Information of Contracts awarded or to be awarded gladly given on request.

TRY OUR SERVICE
Phone Main 3476

FIDELITY AGENCY
OF CANADA
THIRTY SIX TORONTO STREET

WE WILL BOND YOU

Your Credit
is strengthened by our name, reputation and assets—let us issue your Guaranty Bond.

Resources over $31,790,000
Canadian Securities $2,247,500

HEAD OFFICE
36 Toronto Street
TORONTO

Arthur E. Kirkpatrick
General Manager for Canada

BRANCH OFFICES
Paris Building
WINNIPEG

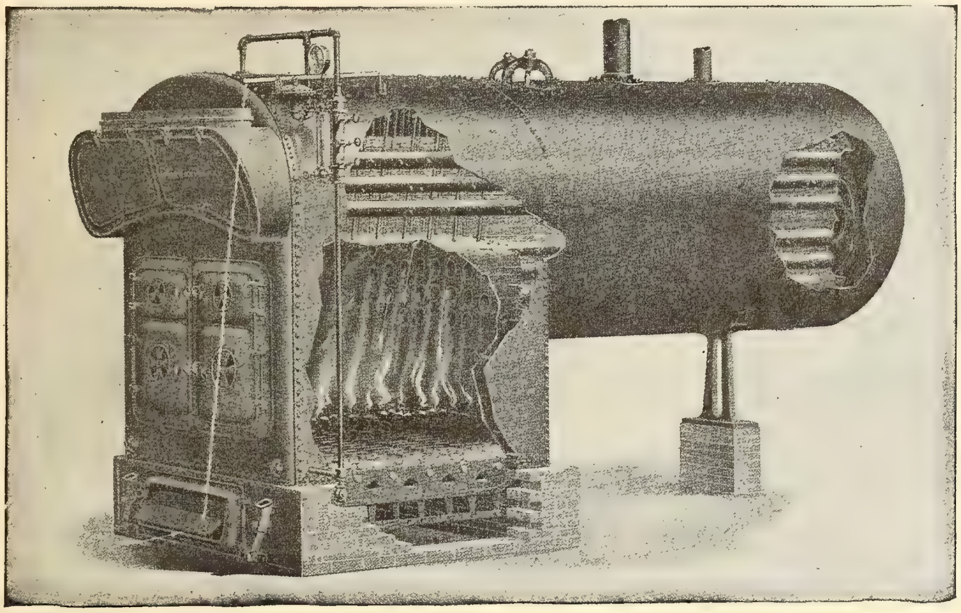
Sidney W. Band
Assistant General Manager

112 St James St
MONTREAL

W. R. Kirkpatrick
Canadian Secretary

UNITED STATES FIDELITY & GUARANTY COMPANY

THE JOHN INGLIS CO.
LIMITED
ENGINEERS AND BOILERMAKERS
ESTABLISHED 1860



BOILERS Of all types built to suit requirements.

TANKS, Stacks, Water Towers, and all classes of Steel Platework.

Engines and Pumps Marine, Corliss and Pumping Engines; Centrifugal Pumps, and all classes of Special Machinery.

First class workmanship—Best quality of materials—Prompt delivery
Write us for Prices, Catalogues, etc.

Office and Works—14 Strachan Avenue, TORONTO, Canada

What Sturtevant Service means to Builders

Sturtevant sales-engineers can point out to you the definite savings that the installation of a Sturtevant heating and ventilating system will mean in the operation of any building.

Pure air is necessary to increase production and efficient working conditions, and pure air can most easily and economically be circulated through warm buildings by a Sturtevant system.

Ask for folder 606 and
invite the co-operation
of our sales engineers

Sturtevant
PUTS AIR TO WORK

B. F. STURTEVANT CO.
of Canada, Ltd.
MONTREAL GALT TORONTO

Will Build More Docks

Nearly fourteen miles of docks and industrial sites will be added to Chicago harbor facilities by the construction of the new Lake Calumet harbor basin, work on which will be started within a few weeks.

The basin will have an inudate area of 2,144 acres and 1,451 acres bordering the basin will be held by the city for docking and factory sites.

From the basin, a wide channel will be run to the Calumet river which offers an outlet to lake Michigan. The harbor and channel will be dredged to a depth of 21 feet and the excavated material used in filling in the surrounding land.

Lake Calumet is situated within a short distance of the new site for the proposed $6,000,000 Ford automobile factorw. Efforts to turn the lake into a harbor have been extended over many years. It is believed the entire project can be completed in six years.

Cement Works Now in Operation

The construction of a Portland cement works at Malaga, Spain, has been finally completed. Work on this factory was started during the early part of 1914, and the bids for the ovens, stone crushers, and engines were awarded to a German firm, which, due to the war, was unable to deliver its materials until the early part of 1921. This factory, which has an annual capacity of 60,000 tons when in full operation, began operating during the month of October, 1921, working but one of its two ovens, which has an annual capacity of 30,000 metric tons. This plant employs approximately 150 men and is built upon an immense quarry, from which an inexhaustible supply of raw material is available. The cement is packed in jute bags of 50 kilos each and sells at the present time for 720 pesetas per ton, f. o. b. Malaga. It is expected that the entire production will be marketed in southern Spain and the north coast of Africa.

Ask State Aid

"Private enterprise is as dead as Queen Anne so far as a solution of the housing problem goes," said Secretary Whyte of the Scottish Housing and Town Planning Council of Glasgow at a Housing Conference recently, which was attended by delegates from all parts of Scotland.

Resolutions were adopted describing housing conditions as worse than just after the war, and calling upon the Government to authorize a resumption of the state-aided building scheme and share any deficit with the local authorities.

Algerian Railroads

Algeria has about 2,000 miles of railroads, nearly all having been built before the war. Since 1914 little conctruction or even repair work has been accomplished. Accordingly a recent loan made available by the government includes an item for railway improvements, about one-third of which will be used for building about 1,028 miles of railway within the next few years.

·BULLETIN·· № 7

·BURLINGTON·STEEL·Co·LTD·

RAIL CARBON

REAL STRENGTH

·HAMILTON·ONT·

"THE·FRAYED·THREAD"

STEEL MANUFACTURERS ALL HAVE A BUG-A-BOO,— A SKELETON IN THEIR CLOSET CALLED "PIPED STEEL".

WITH ALL THE REFINEMENTS IN MODERN STEEL MAKING, IT HAS NEVER BEEN FOUND POSSIBLE TO ELIMINATE PIPING ENTIRELY, AND IN EVERY FORM OF STEEL WORK ITS PRESENCE IS ALWAYS TO BE FEARED.

WE HAVE ALREADY EMPHASIZED THE FACT THAT **RAIL-CARBON STEEL** IS SUBJECTED IN ITS PRIMARY MANUFACTURE TO A VERY SEVERE INSPECTION TO GUARD AGAINST PIPING. THE INGOT FROM WHICH THE RAIL IS ROLLED IS CUT THROUGH HORIZONTALLY, AND THE TOP PORTION CONTAINING THE PIPING IS DISCARDED.

SUFFICIENT OF THE INGOT MUST BE DISCARDED SO THAT NO EVIDENCE WHATEVER OF PIPING WILL APPEAR IN THE BOTTOM PORTION RETAINED.

IN THE MANUFACTURE OF HEAVY ORDNANCE, THE INSPECTION GOES EVEN FURTHER, AND TO MAKE DOUBLY SURE ON THIS POINT, IT IS LAID DOWN THAT THE INGOT SHALL BE CUT **VERTICALLY** THROUGH THE CENTRE TO FIND OUT JUST WHERE THE PIPING STOPS.

A RAIL **STANDING ON END** IS SIMPLY AN **ELONGATED INGOT** AND THE FIRST OPERATION IN THE MANUFACTURE OF RAIL-CARBON BARS, IS TO SLIT THE RAIL FROM END TO END IN TWO PLACES.

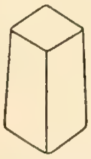
THIS AT ONCE EXPOSES ON THE SURFACE ANY PIPING THAT MIGHT HAVE CREPT PAST PREVIOUS INSPECTIONS, AND THE DEFECT AT ONCE BECOMES VISIBLE, AND THE MATERIAL CONSEQUENTLY IS REJECTED.

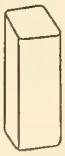
IF IT WERE NOT REJECTED THE DEFECTIVE MATERIAL WOULD JAM IN THE ROLLS AND CAUSE A SERIOUS DELAY.

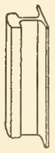
JUST AS A FRAYED THREAD CANNOT PASS THROUGH THE EYE OF A NEEDLE NEITHER CAN A PIPED RAIL PASS THROUGH OUR ROLLS

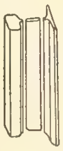
IN OTHER WORDS, THE PRESENCE OF "PIPING" WITHIN THE THICKNESS OF A RAIL-CARBON BAR, IS JUST AS IMPROBABLE AS ITS PRESENCE IN THE STEEL OF THE "QUEEN ELIZABETH'S" 15 INCH GUNS.

THIS IS JUST ONE MORE REASON WHY **RAIL-CARBON BARS** ARE THE STRONGEST AND MOST RELIABLE ON THE MARKET TODAY.


·THE·INGOT·


·THE·BLOOM·


·THE·RAIL·


·THE·SLIT·RAIL·

SPECIFY RAIL-CARBON FOR REAL STRENGTH

·BULLETIN·№ 8–4½·BILLION·VIBRATIONS.·

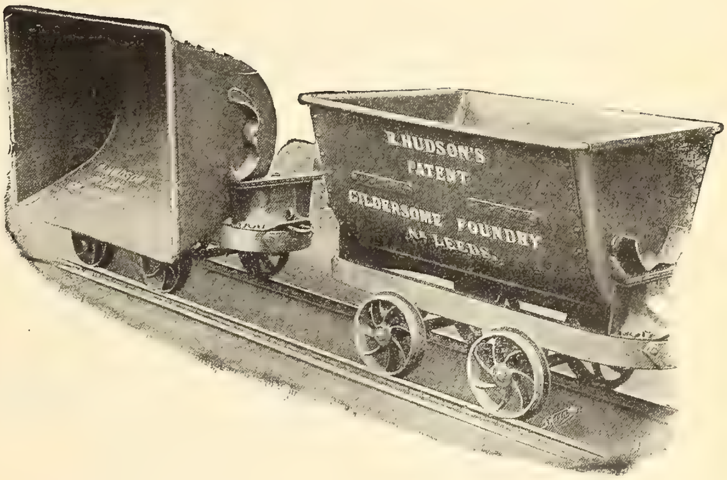
Current Prices of Building and Engineering Materials

		Toronto	Montreal	Winnipeg	Vancouver
CEMENT (Delivered on job):—					
Retail lots including bags	per bbl.	$4.60	$4.40	$4.80	$3.70
Car lots, including bags	per bbl.	3.35	3.68	4.16	3.35
Refund on bags	each	.20	.20	.20	
LIME (Delivered on job):—					
Lump, in retail lots	per ton	14.30	14.00	.58 bu.	2.70 bbl
Lump, in car lots	per ton	12.70**	11.00	13.80 ton*	2.60 bbl
Hydrated, in retail lots	per ton	20.00	26.00	.60 bag*	30.00
Hydrated, in car lots	per ton	19.00	21.00	.54 bag*†	25.00
BRICK and TILE (Delivered on job):—					
Common face brick	per M.	24.00	16.00*	19.00	30.00
No. 1 dry pressed brick	per M.	31.00	30.00	36.00	70.00
No. 2 dry pressed brick	per M.	29.00	25.00	32.00	
Enamelled brick	per M.	125 up to	230.00	185.00	150.00
Wire cut brick, for foundation work	per M.	21.00	19.00		50.00
Sand lime brick	per M.	17.00		18.00	
Hollow building tile	per M			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	60-95	60-75	85-100	80.00
Fire clay	per ton	13-20	15-16.00	35.00**	22.00
STONE, SAND and GRAVEL (f.o.b. cars on siding):—					
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.00 yd
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 "	" "
Crusher run	per ton	2.20½		3.00 "	" "
Rubble stone	per ton	2.45	1.70	15.00 cord	" "
Gravel, 2 in. screened	per ton	2.05		2.45 yd.	" "
Gravel 1 in. screened	per ton	2.31	1.50	2.75 "	" "
Sand, screened	per ton	1.42½	1.25	1.90 "	" "
Pit run	per ton	1.52¾	1.35	1.90 "	" "
STEEL and IRON (f.o.b. warehouse):—					
Mild steel bars, ¼ in. and heavier	per 100 lbs.	3.25 base	3.25 base	4.35	$4.00
Bands 3/16 in. and lighter	per 100 lbs.	3.75 "	3.25 "	4.85 base	
Hoops	per 100 lbs.	4.50 "	4.25 "		
Twisted and deformed bars	per 100 lbs.	3.35 "	3.25 "	4.20	4.00
Angles, channels and tees under 3 in.	per 100 lbs.	3.35 "	3.75 "	4.95	6.00
Structural shapes	per 100 lbs.	3.60 "	3.75 "	4.75	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.25 "	3.50 "	4.75	6.25
Plates—3/16 in.	per 100 lbs.	3.60 "	3.85 "	5.15	6.50
Plates—10 gauge	per 100 lbs.	4.15 "	4.00 "	5.45	6.50
Black sheets—28 gauge	per 100 lbs.	5.00 "	4.50 "	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.20 "	6.00 "	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	6.20 "	6.50 "	7.70	8.25-8.50
Rivets	per 100 lbs.	5.75 "	5.50 "	7.00 base	
Cast iron pipe	per ton	60.00	55.00		
VITRIFIED CLAY PRODUCTS (Delivered on job):—					
Sewer pipe, 4 in.	per ft.	.40	.30	.35	.28
Sewer pipe, 6 in	per ft.	.60	.45	.45	.48
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.55
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.70
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.85
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00	.90	.65	.75
Chimney tops	each	9.00	3.50–5.00	7.50	4.50–6.00
Discounts		45 % truck lots	20 %		
		50 % car lots	50 %	5 %	

CEMENT:—*Discount of 10 cts. per bbl. in 20 days. Price f.o.b. cars is $3.75 †Subject to 5% discount. **Excluding bags.
LIME:—*Discount of 5%. †Bag of 50 lbs. **Price f.o.b. cars is $11.70.
BRICK AND TILE—*f.o.b. plant.
STONE SAND AND GRAVEL:—*Winnipeg prices subject to 5% disco **Toronto prices include sales tax

CONTRACTORS
Please Note

We are again carrying in stock at Montreal the famous



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TWO-WAY
STEEL DUMP CARS

Roller Bearing, Steel Wheels. Especially suitable for Concrete, Rock, Cinders etc.

Catalogues and Prices on application
to the
Sole Canadian Distributors

MUSSENS LIMITED

Montreal Toronto Winnipeg Vancouver

CURRENT PRICES OF BUILDING AND ENGINEERING MATERIALS— continued

Lumber (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver*
Flooring, 1 x 3 and 4 in., clear, E. G. fir	per M.	100.00	60.00	84.00	55.00
Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	75.00	65.00	56.00	30.00
Flooring, No. 1 pine	per M.	70.00	80.00	64.80	
Flooring, No. 1 Spruce	per M.	45.00	40.00	39.60	
Flooring, birch and maple, 13/16 in. clear	per M.	130.00	110.00	152.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	130.00	125.00	140.00	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	75.00	60.00	56.00	30.00
V joint, No. 1 pine	per M.	70.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	43–58	45.00	63.75	
Pine, 2 x 4 to 12 in., common rough	per M.	50/55	70.00	36.00	
Hemlock, 2 x 4 to 12 in.	per M.	40-42.00	40.00	36.00	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	40–50.00	50.00	36.00	11.00-13.50
Spruce, 1 and 2 x 4 to 12 in.	per M.	41/46	45–35	36.00	
Timbers, fir, 10 x 10 in. and up	per M.	65.00	58.00	47.00 base	17.-22.00
Lath, No. 1 white pine	per M.	14.00	12.00	12.00	
Lath, M. R. spruce	per M.	10.00	8.50	10.00	7.00
Shingles, XXX B.C. cedar	per M.	6.35	5.00	5.25	3.40
XX B.C. cedar	per M.	5.00	4.25	3.75	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	108.00	55.00
Fir casing	per M.	1 ct. per in.	100.00	108.00	

PAINTS, OILS, COLOURS (delivered):—

		Toronto	Montreal	Winnipeg	Vancouver*
White lead ground in oil, less than ton lots	per cwt.	14.55	13.35	14.85	15.80
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	22.00
Putty in bulk	per cwt.	6.70	3.75	5.50	9.25
Steel sash putty in bulk	per cwt.	7.20	6.00	8.75	7.75
Boiled linseed oil, in bbls.	per gal.	1.15	1.04	1.13	1.28
Raw linseed oil, in bbls.	per gal.	1.18	1.02	1.10	1.25
Turpentine, in bbls.	per gal.	2.25	1.95	2.15	1.60
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 4/5	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 1/5	.45

PLASTER (Delivered):—

		Toronto	Montreal	Winnipeg	Vancouver*
Hard wall plaster, sanded	per ton	13.50	15.00	25.00	30.00
Plaster of paris, in bbl. lots	per bbl.	6.00	5.35	1.60 bag*	7.50
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu.	1.50

LABOR:—

		Toronto	Montreal	Winnipeg	Vancouver*
Bricklayers	per hr.	1.00	.80–.90	1.15	1.06¼
Structural Iron Workers	per hr.	.85	.50–.75	1.25	1.00
Plasterers	per hr.	1.00	.80	1.05	1.06¼
Hoisting Engineers	per hr.	.70–.80	.50	.90–1.10	1.00
Plumbers	per hr.	.90	.60–.75	1.00	.90
Carpenters	per hr.	.80	.65	.90	.81¼
Painters	per hr.	.75	.55–.65	.80	.81¼
Electrical Workers	per hr.	.80	.65	.70– .90	1.00
Roofers	per hr.	.65	.65		.90
Laborers	per hr.	.40–.50	.30	47½–.55	.50–.56¼
Sheet Metal Workers	per hr.	.75			.90

LUMBER:—*Owing to the general unstable condition of the present lumber market, Vancouver dealers refuse to quote any prices at all especially for Prairie or Eastern publication. The prices are, moreover, fluctuating from day to day. Such prices as we quote are, therefore, averages and not standard.

PLASTER *Including bags.

SCREEN GRAVEL
PEA GRAVEL
SAND

Rapid Truck Delivery. Just Phone
Beach 1128 or 1780

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STOP 19, KINGSTON ROAD
TORONTO, ONT.

Start *now*— to work for Good Roads!

IT'S none too early. Spring—the season when actual operations must begin—is just over the hill. Plan now to have the Tarvia Truck working in your community this year.

Tarvia roads are moderate in first cost and more economical to maintain than any other type of highway that will stand up under modern traffic. Their non-skid surface is smooth, dustless and mudless all the year round.

Call on our Special Service Department. The experience of skilled highway engineers—based on intimate knowledge of every type of road construction—is freely at your service.

Please address your letter to our nearest branch. It will receive prompt and careful attention.

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The Barrett Company
LIMITED

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ST. JOHN, N. B.

Cyclone Churn Drills

For Blast Hole, Water, Shallow Oil and Gas Well Drilling and Mineral Testing

The No. 14 Cyclone Blast Hole Drill is a machine especially designed and constructed for drilling blast holes in quarries, open pit mines and for heavy rock excavation. Built in two sizes in both traction and non traction types with gasoline, electric or steam power. Covered in our Catalog B-45.

Cyclone Well Drills are built in 5 sizes, capacities 200 to 2000 feet and in both traction and non traction types with gasoline or steam power. Will operate cable and hollow rod drilling tools, the latter by either the self-pumping or jetting process. Well Drills are described in our Catalog A-70.

The Sanderson-Cyclone Drill Co., Orrville, Ohio, U.S.A.

Mussens Ltd., Canadian Representatives — Montreal, Toronto, Winnipeg and Vancouver

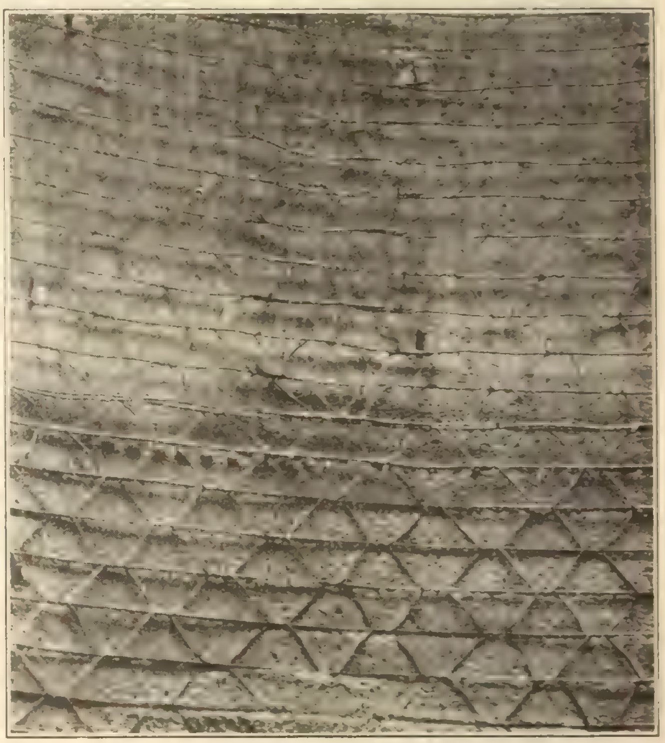
A 20 Year Old Standpipe

on the Guggenheim estate at Port Washington, Long Island had become, corroded to the extent shown by the pock marks in the photograph. When the "Cement-Gun" was finally called in and used for both sand-blasting and Guniting, this veteran standpipe was successfully operating again just seven hours after receiving its final coat of Gunite.

When are you going to purchase your Guniting equipment and get your share of this work?

CEMENT-GUN COMPANY, INC.
ALLENTOWN, PA.
New York, Pittsburgh, Chicago, Sioux City,
Los Angeles, Seattle

Agents in Eastern Canada: General Supply Company of Canada, 356 Sparks Street, Ottawa. Foreign Agency International Cement-Gun Company, Ziest, Holland



At the bottom you will note first application on Gunite. Stand pipe is 80 feet high with a 20-foot diameter.

The "Cement-Gun" is not a restricted article. It may be purchased from us and used by anyone.

FOR SALE

1 72" x 16' H.R.T. boiler 125 lbs. working pressure.
1 22 h.p. locomotive type 130 lbs. working pressure.
1 12 x 12 Ingersoll Rand belt driven air compressor.
1 ⅝ yard steam shovel on traction wheels.
1 ¾ yard rebuilt Erie on traction wheels with boom hoist and high lift boom.
1 1½ yard Marion railway type.
1 Model 61 Marion 2½ yard railway type.
[illegible] tons 25 lb. rail.
500 tons 56 lb. rail.

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505 Lumsden Bldg., Toronto, Phone Main 2033

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also

Scarifier Teeth

Made of high grade plow steel. We carry a stock of about 3,000 blades at all times.
We furnish blades for all makes of road graders.
Let us prove to you the merits of our product.

Send us your enquiries.

Manufactured by
SHUNK MANUFACTURING COMPANY
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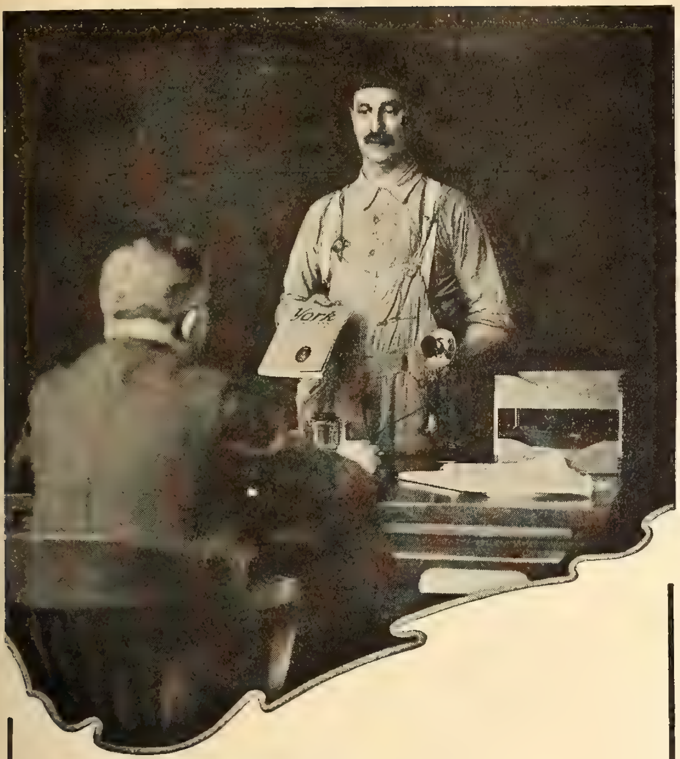

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When the Operating Engineer of an Ice Making or Refrigerating Plant insists upon the Plant Manager buying York Ammonia Fittings and Supplies, he knows he is saving himself a lot of time and trouble and also reducing the operating costs of the plant.

He knows, because he has learned through past experiences of his own, or perhaps from another Engineer, that York Equipment is designed and made to meet the severest service.

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AUTOMATIC DUMP BODY

DUMPS WITHOUT POWER
Saves 40% First Cost

Cheaper to maintain and operate.

Dominion bodies use no hoist.

They save weight and expense of extra parts and they increase daily tonnage.

Bodies are made to fit any type of truck (special type for Ford) and answer every purpose of a body equipped with a power operated lifting device but eliminates complication inherent in power dumping bodies.

Pulling one handle does the work.

The body rolls over and dumps automatically. The end gate opens and closes automatically.

Write for full information and price.

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Established 1914

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PURE WATER

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"VENTURI" Registered

have proved to be able and unfailing allies to thousands of towns and cities in the constant fight against waste and the unauthorized use of water. When placed in well-planned locations in the supply and distribution mains, a constant and accurate knowledge of flow is available. The Venturi Register-Indicator-Recorder not only gives total flow but makes a permanent record on a 12" circular chart of every change of rate throughout every hour, day and night. Venturi Meters last as long as the pipe lines of which they form a part.

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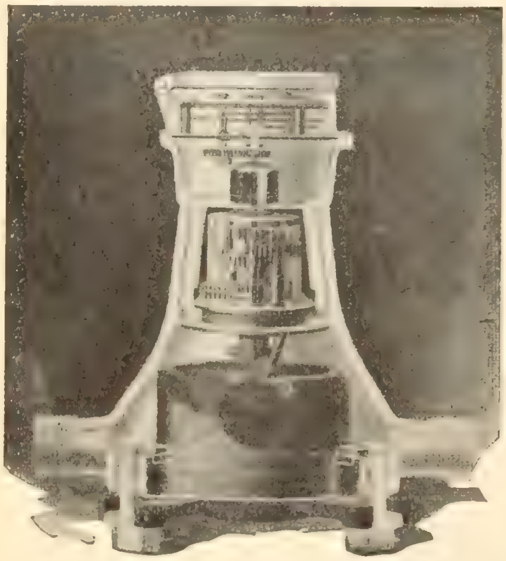

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Meter development has been so consistently advanced by Neptune engineers that Trident meters have been kept far in advance.

They were the first Frost-Proof Meters using Snap Joint Disc Chamber Construction, the first using Anti-Friction Disc Thrust Roller Construction, the first Compound Meters, the first with Renewable and Heat-Proof Rubber Bushings on all Bearings, the first Portable Test Meters, the first employing a successful Protected and Lubricated Oil Enclosed Gear Train—it is interchangeable.

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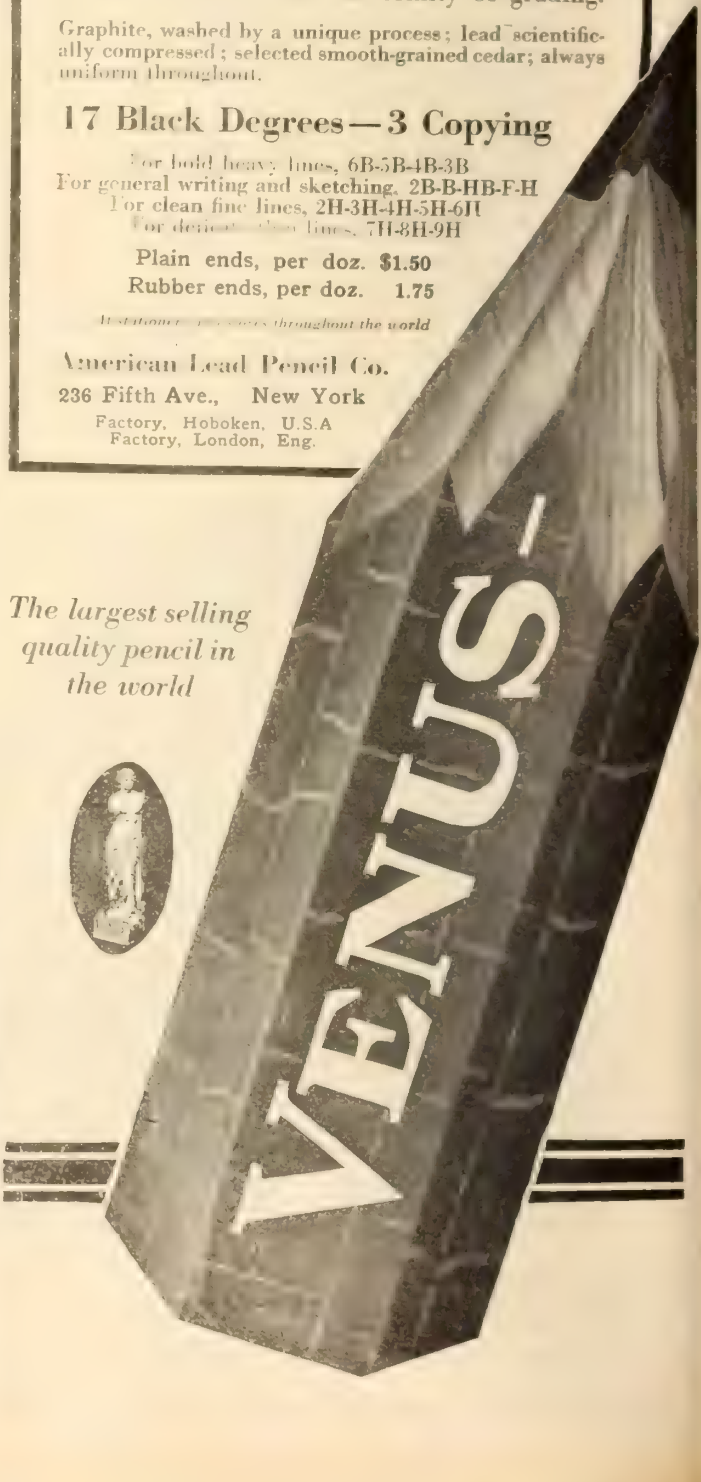

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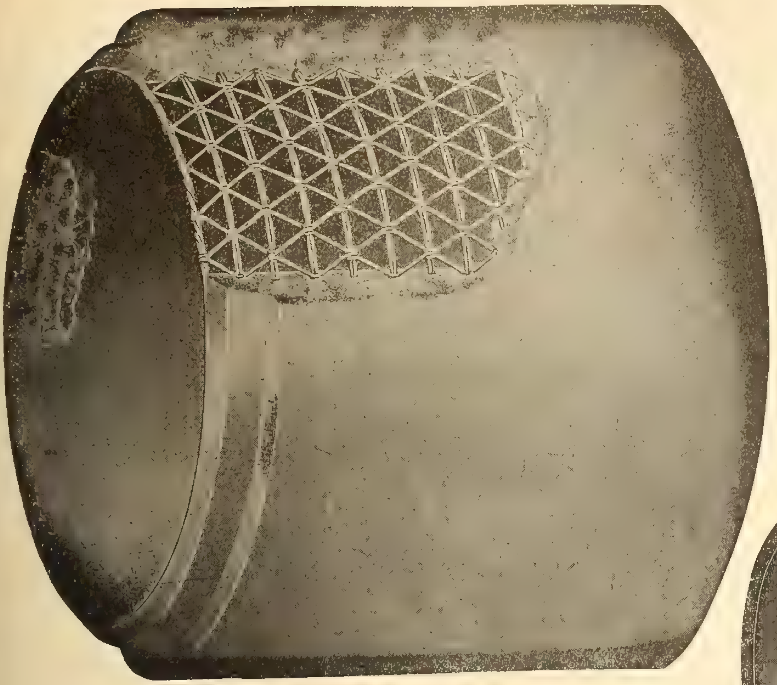

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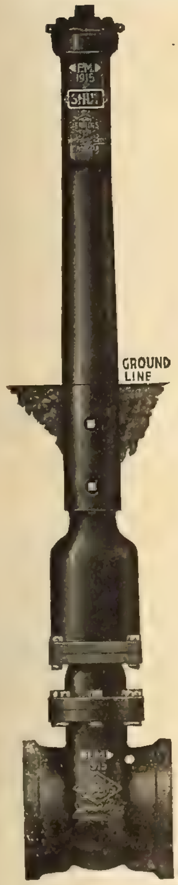

Fig. 345 complete with valve

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Just as reliable as Jenkins Valves because made under the self same manufacturing standards, embodying the best materials, the most expert designing and the most careful workmanship.

Jenkins Indicator Posts function satisfactorily. The strain of severe usage, so fatal to less dependable equipment, leaves a Jenkins Post unimpaired.

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Five or twenty years after erection a building so cleaned is to all outward appearances a new structure.

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For thirty years our product has given universal satisfaction for exteriors—interiors—courts.

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WHY do Government regulations specify that contracts for construction, equipment and supplies over a certain minimum amount must be advertised?

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WHY do Consulting Engineers, Architects, and others recommend and endorse the advertising of Contracts To Be Let?

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In the answers to the foregoing questions you will find unquestionable proof that

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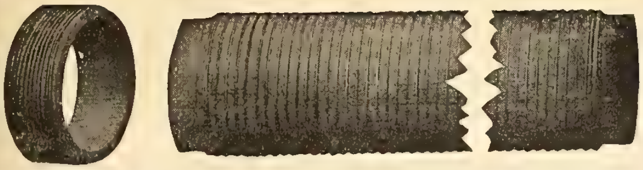
3—**Contract Record & Engineering Review** is universally recognized as the one dominant medium of **national** circulation for advertising Contracts To Be Let.

Are your contracts advertised?
Are they advertised where the right men will read?
If not—why?



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from 2 in. to 24 in. diameter

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Luxfer Sidewalk and Window Prisms pay for themselves many times over in the increased value of the building where they are installed. Dark basements become light and well ventilated adding greatly to the floor space. Particulars on request. Also iron window frames, ventilators, canopies, etc.

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Contract Record and Engineering Review

The wise manufacturer uses the "Contract Record and Engineering Review" not only to save his salesmen time but also to save the time of the Jobbers' salesmen.

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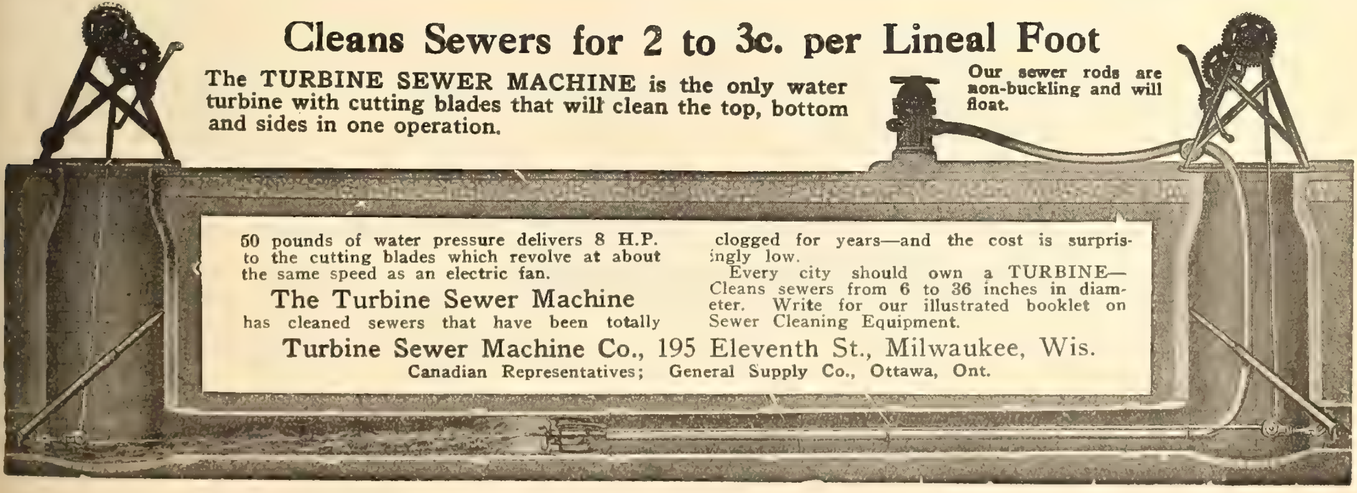
Cleans Sewers for 2 to 3c. per Lineal Foot

The TURBINE SEWER MACHINE is the only water turbine with cutting blades that will clean the top, bottom and sides in one operation.

Our sewer rods are non-buckling and will float.



50 pounds of water pressure delivers 8 H.P. to the cutting blades which revolve at about the same speed as an electric fan.

The Turbine Sewer Machine has cleaned sewers that have been totally clogged for years—and the cost is surprisingly low.

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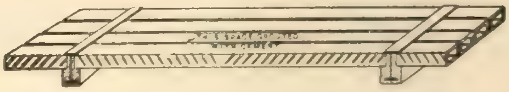

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Put our 60 years of highly specialized training and experience to work on your chimney problems

Send for data-photographs and names of customers

WM. SUMMERHAYS & SONS
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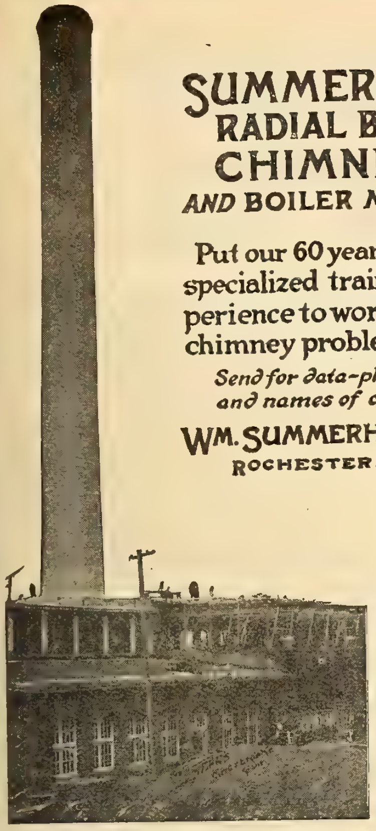

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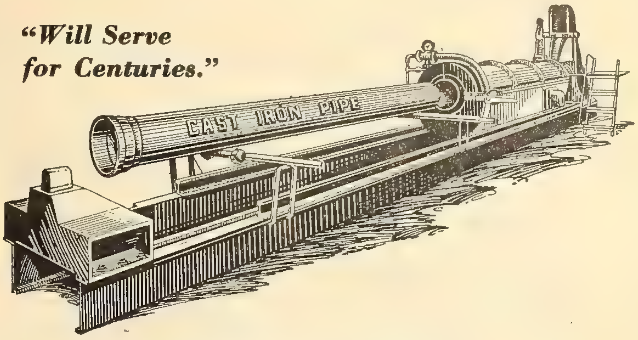

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Manufactured by
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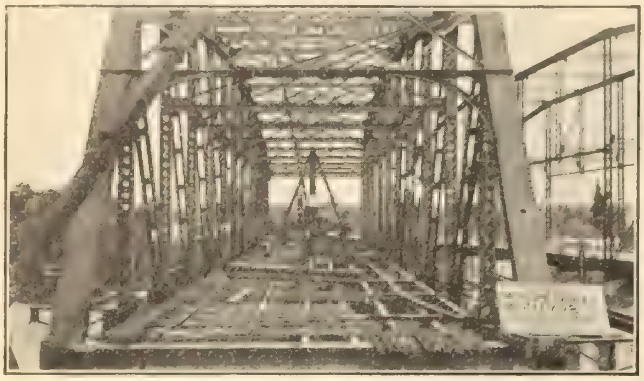

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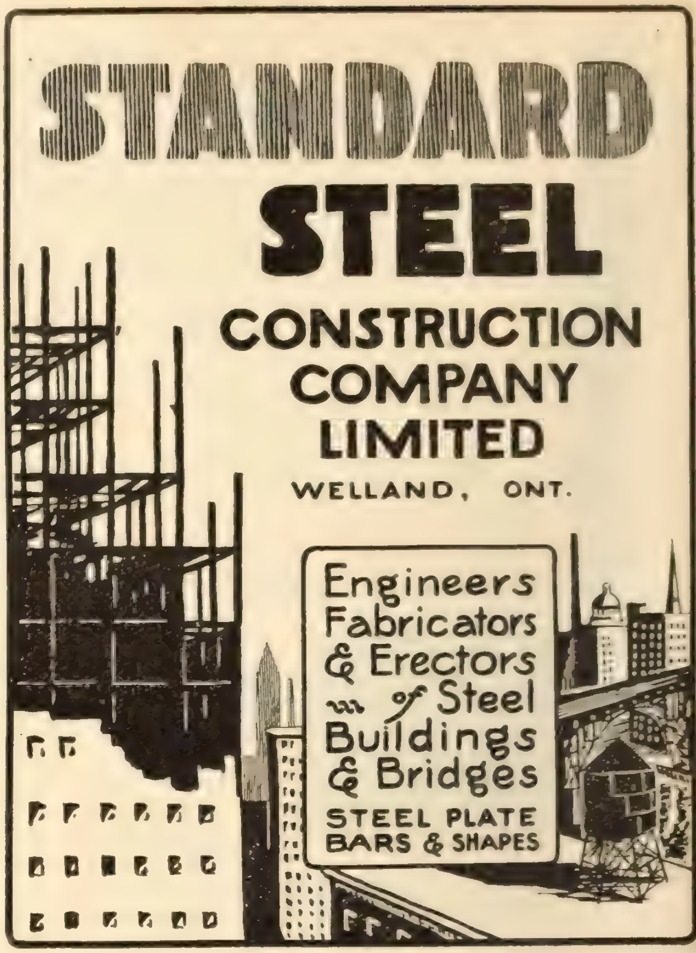

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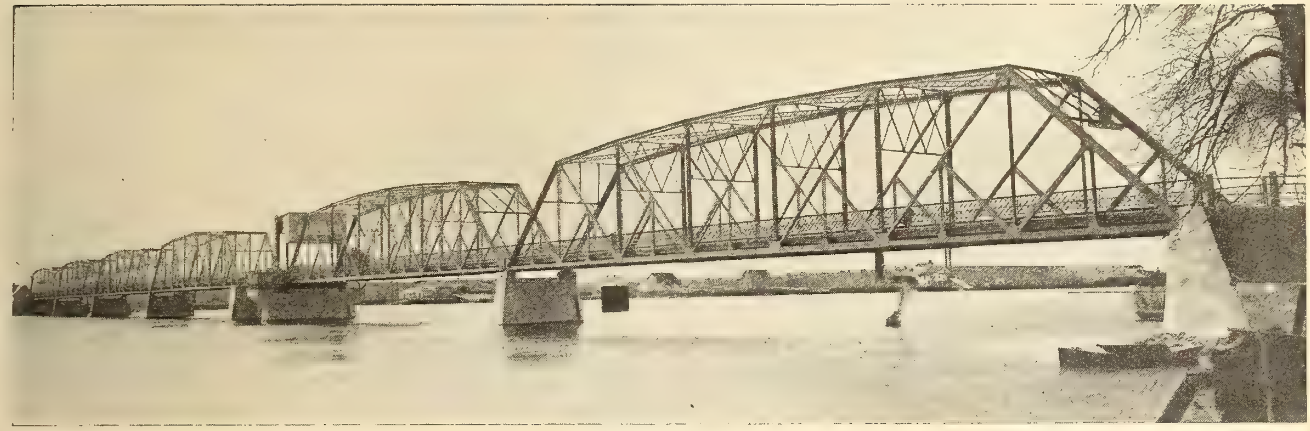

The Batiscan River Bridge consisting of six fixed spans and one bascule span, totals 1211 ft. face to face of abutments and was entirely fabricated and erected by us.

F. B. Painchaud, Ass't Chief Engineer, Dept. of Public Works & Labor, Quebec, in writing of this bridge remarks, "Great credit is due the MacKinnon Steel Co., Limited, who fabricated and erected the bascule span with machinery complete."

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2 " 45 lb. " "
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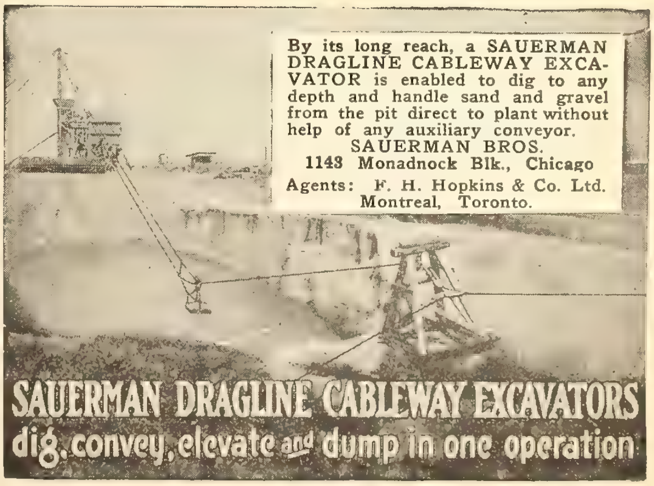

By its long reach, a SAUERMAN DRAGLINE CABLEWAY EXCAVATOR is enabled to dig to any depth and handle sand and gravel from the pit direct to plant without help of any auxiliary conveyor.

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dig, convey, elevate and dump in one operation

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THE KIND THAT MAKES

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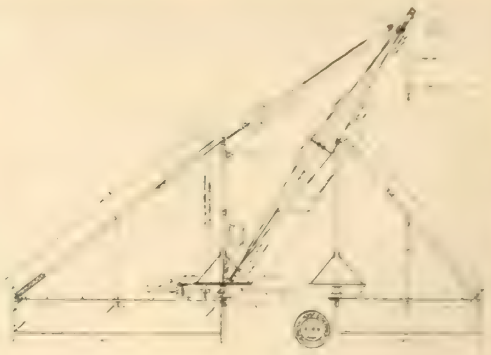

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At Dorval, Quebec, near Montreal, we have stored and ready for sale seven "AMERICAN" Wooden Stiffleg Derricks on which we can make immediate delivery at a very interesting price.

Originally these derricks were set up in a shipyard, but none of them has seen much service and some were never used at all. Some of these derricks have 70-foot booms; some 65, and the rest 60, all 14" x 16" Timbers with Truss Rods. The masts are 16" x 16" x 30 feet high. One stiffleg is 14" x 14" x 54 feet long, the other is 14" x 14" x 43 feet. These derricks are not provided with sills. The derrick timbers are all painted.

The complete equipment of each derrick includes all necessary irons, sheaves, blocks, etc., and a 12 ft. bull wheel with guide sheaves.

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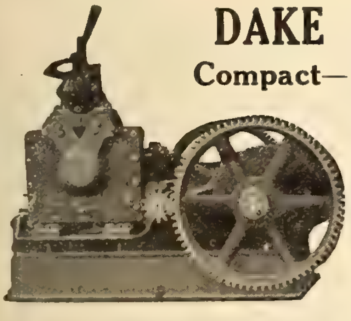

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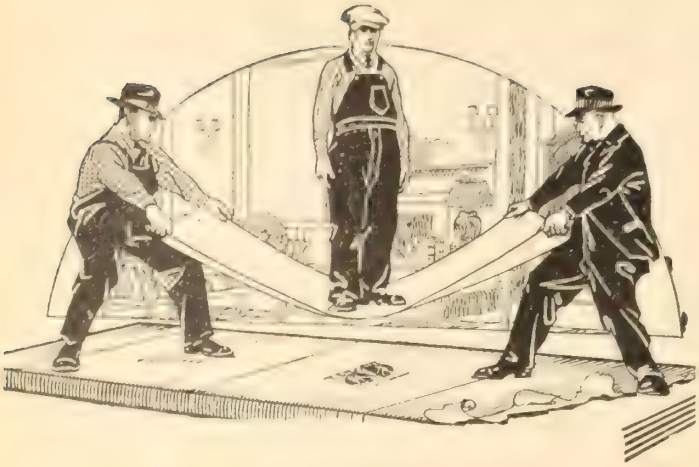

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Faithful

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Each elevator is equipped, when so specified, with the TURNBULL Safety Gate which prevents accidents at the shaft door where 80 per cent of them happen.

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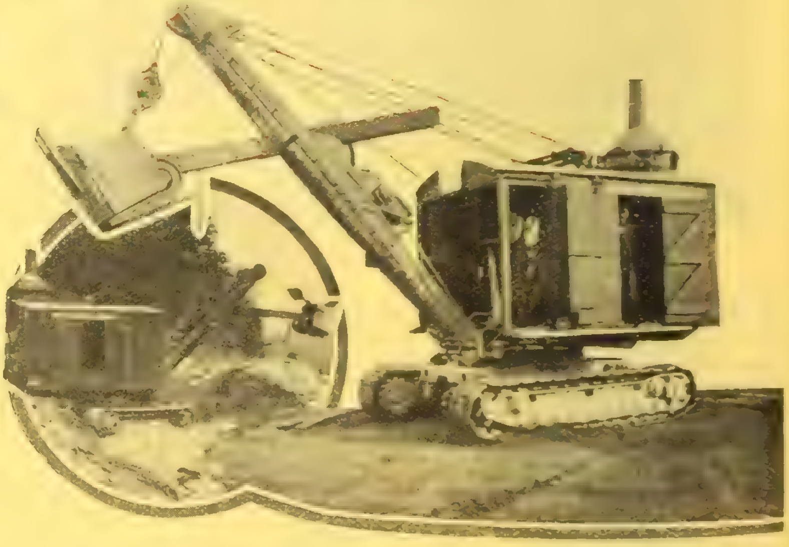

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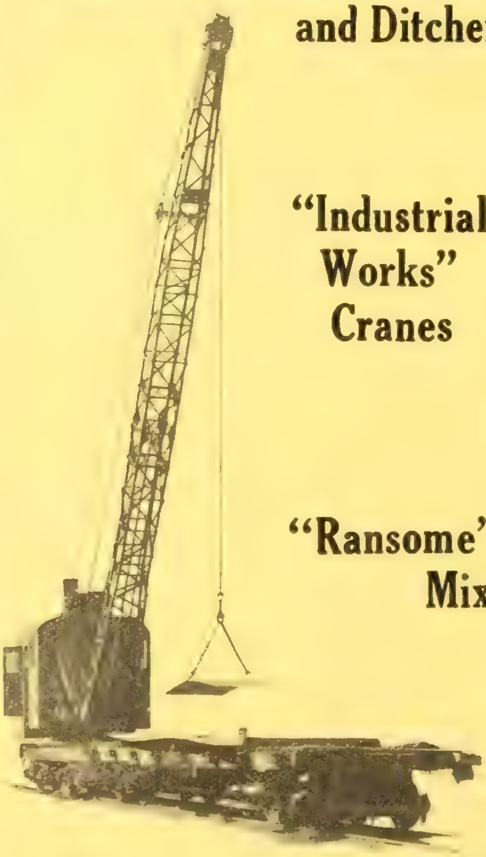

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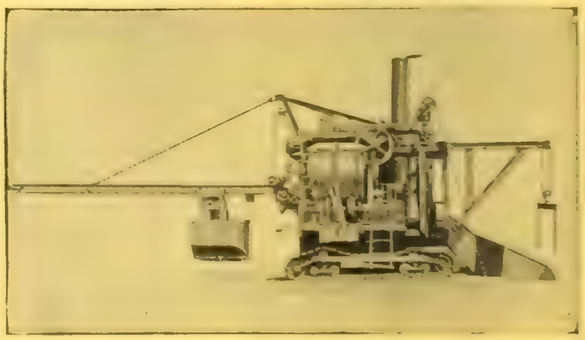
and
Discharge



Branch:
108 Mail Building,
TORONTO
Telephone Adelaide 840

F·H·Hopkins & Co.
Limited

Head Office
MONTREAL
Telephone Main 3420

Vol. 37 Toronto, February 14, 1923 No. 7

Contract Record and Engineering Review

General Accident Assurance Co., Building
Toronto - Ontario

F. S. BAKER - - - Architect
CRANE LTD. - Plumbing Fixtures
BENNETT & WRIGHT LTD. Plumbers

Equipped throughout with—

Royal Flush Valves

SLOAN VALVE CO., Ltd.
67 Adelaide St., East
TORONTO

Alphabetical Index to Advertisers Page 16 **Classified Directory to Advertisements Page 6**

"Brantford" ***success is your best reason for specifying*** **Brantford Roofs**

Brantford Roofing Co. has promoted the development of Asphalt Slates in Canada; introduced new styles and colors; improved processes of manufacture and stood behind its trade marks to the limit.

That is the reason for Brantford Success, and that is the reason why you should specify Brantford Asphalt Slates.

Brantford Roofing Co., Limited

Head Office and Factory: Brantford, Ontario

Branches at: Toronto Montreal Halifax Winnipeg

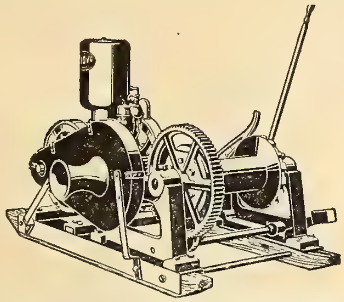


Fig. 72—London Single Drum Hoisting Engine, Type A

LONDON BUILDERS' HOISTING ENGINES

are built in all sizes and styles to meet the requirements of the Building and Contracting Industry.

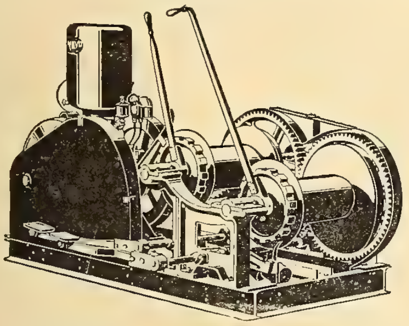


Fig. 75—London Double Drum Hoisting Engine, Type C

Gasoline Operated Hoisting Engines have revolutionized all methods of hoisting and pulling just in the same manner as the Gasoline Operated Automobile has outdistanced old methods of transportation.

WHY? Because, Gasoline Operated Hoisting Engines can be operated without experts or engineers. No night watchman required. They are easily moved, easily operated and as flexible at the throttle as the modern automobile. They meet every hoisting or pulling requirement. They cost less to purchase and maintain; less to operate and will show a substantial profit over old methods every day they are in use.

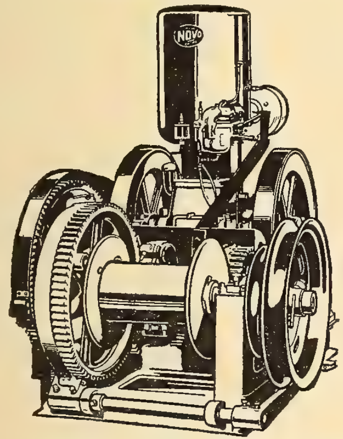


Fig. 64—London Single Drum Reversible Hoisting Engine, Type B

We manufacture a complete line of Gasoline and Electric Operated Hoists. Tell us your requirements and we will submit our proposal to meet your needs.

We manufacture Concrete Mixers, Hoists, Air Compressors, Pumps, Brick, Block and Tile Machines, Barrows, Carts, Silo Moulds, Ornamental Moulds and Tools.

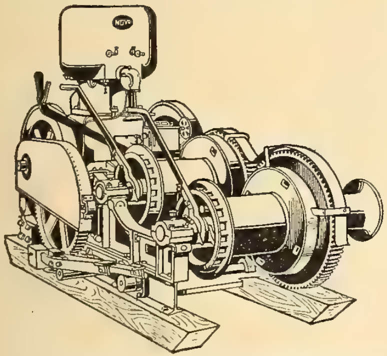


Fig. 80—London Heavy Duty Double Drum Hoisting Engine, Type E

The London Concrete Machinery Co., Limited

Dept. 7 London, Canada

World's Largest Manufacturers of Concrete Machinery

Sales Offices and Warehouses:

R. R. Power, Halifax, N.S.
T. McAvity & Sons, St. John, N.B.
Rene Talbot, Quebec, Que.
O. E. Barnard, Sherbrooke, Que.
R. G. Noll, Hamilton, Ont.

Geo. F. Foss Machy. & Supply Co. Montreal.
Harvard Turnbull & Co., Toronto.
General Supply Co., of Canada, Ottawa and Winnipeg.

E. A. Muir, Port Arthur.
Gorman's Limited, Calgary and Edmonton.
West Kootenay Equipment & Construction Co., Nelson, B.C.
B. C. Equipment Co., Vancouver.

"HEAVY DUTY"

"Heavy Duty" Construction Keeps up Your Production Curve

HAZARDS enough you must take—of bad weather, haulage difficulties, supply delays!

And there is no other way to compensate for these losses except with a mixer that eagerly takes all you give it—and brings you no additional hazard of nagging trouble.

It's your protection, your profit-earner, **that** kind of a mixer.

That's the principle behind Koehring "heavy duty" construction—

—to bring to bear all that the Koehring organization possesses of stubborn purpose, of special experience in both design and construction in building the mixer, not alone of fast performance, but of **overshadowing, dominating dependability.**

—and the same construction goes into Koehring Crane-Excavators and every Koehring product.

Koehring Company of Canada, Limited

TORONTO
105 Front St. East,
Phone Main 1498

MONTREAL
616 Canada Cement Bldg.
Phillips Square
Phone Uptown 3026

KOEHRING

PUDLO
BRAND
CEMENT WATER-PROOFING POWDER

A Big Boon To The Contractor

A sudden thaw or flood brings no anxiety to the Contractor whose work has been waterproofed with PUDLO, as no water has been known to enter a structure where our easy instructions have been followed.

PUDLO requires no particular skill, and no extra labor. It prevents discoloration and hair-lines in stucco. It also acts as a lubricant, enabling cement to be worked more easily and with less water.

PUDLO Powder must not be confused with ordinary inert compounds. Write for further information.

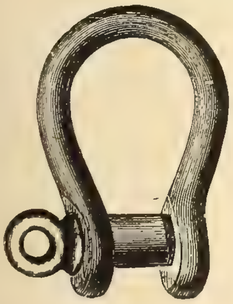
Spielman Agencies Regd., **45 St. Alexander St., Montreal**

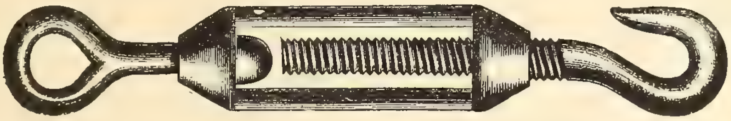
Ottawa......J. W. Anderson, Bank St. Chambers
Toronto............C. W. Beal, 60½ Adelaide E.
London......E. R. Seabrook & Co., 119 King St.
Halifax......R. R. Power, 311 Royal Bank Bldg.
Quebec........Pruneau & Co., 149 St. Pierre St.
Sault Ste Marie....N. G. Dehaas, 651 Queen St.
St. John, N.B............ T. McAvity & Sons
Winnipeg, Edmonton, Calgary, Saskatoon Winnipeg Paint & Glass Company Ltd.

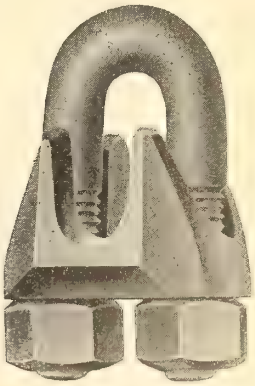
Immediate Service to Engineers and Contractors

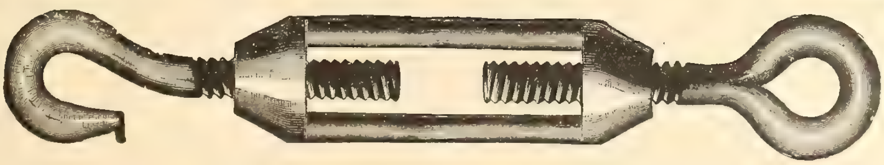
WE CARRY IN STOCK FOR IMMEDIATE DELIVERY:

Wire Rope Blocks.
Wire Rope Snatch Blocks.
Manila Rope Blocks.
Manila Rope Snatch Blocks.
Wire and Manila Rope Splicing.
Waterproof Tarpaulins, Covers.
Rope Slings, Manila Rope.
Feed Bags, Horse Covers.
Tents, Cotton Duck, Flags.
Oiled Clothing, Oakum.
Blast Nets.









We endeavour to ship goods same day order is received. **Write for Catalogue.**

JOHN LECKIE LIMITED - 77 Wellington St. W. - Toronto, Ont.

House of Quality, Service, and Satisfaction

CLASSIFIED INDEX TO ADVERTISEMENTS

The following regulations apply to all advertisers:—Eighth page, every issue, three headings; quarter page, six headings; half page, twelve headings; full page, twenty-four headings

- Acid Proof Fans
  - Sturtevant, B. F. & Co.
- Air Washers
  - Sturtevant, B. F. & Co.
- Architect's Supplies
  - Geo. Vincent
- Aluminum
  - H. Mueller Mfg. Co., Limited
  - Spielman Agencies Regd.
- Architectural Iron
  - Northern Architectural Iron Works
  - Canada Wire & Iron Goods Co.
  - McGregor & McIntyre
- Ash Hoists
  - Canadian Link-Belt Co.
- Asphalt
  - Imperial Oil Company, Ltd.
- Beam Spans
  - Hamilton Bridge Works Co.
  - MacKinnon Steel Company
  - Sarnia Bridge Company
- Bearing Metal
  - H. Mueller Mfg. Co., Limited
- Blades
  - **Shunk Mfg. Co.**
- Blast Hole Drills
  - Hopkins & Co., Ltd., F. H.
  - Mussens Limited
- Blast Gates
  - Sturtevant, B. F. & Co.
- Blocks (Wire and Manila Rope)
  - **Clyde Iron Works Sales Co.**
  - Hopkins & Co., Ltd., F. H.
  - Leckie Co., John
- Blowers and Compressors
  - Canadian Blower and Forge Co
  - Sturtevant, B. F. & Co.
- Boilers
  - Inglis Company, John
  - McGovern, T. J.
  - Mussens Limited
  - Waterous Engine Works Co.
- Boiler Inspection
  - Trades Labor Branch Dept Public Works
- Books (Technical)
  - Walker Co., Frank A.
- Boxes—Junction
  - Standard Underground Cable Co., of Canada, Limited
- Brick Dryers
  - Canadian Blower and Forge Co.
- Brick Machinery & Supplies
  - Hepburn, Ltd., John T.
- Brick
  - Don Valley Brick Co.
  - Milton Pressed Brick Co.
  - York Sandstone Brick Co.
- Bridges
  - Hamilton Bridge Works Co.
  - Horton Steel Works, Ltd.
  - Standard Steel Construction Co
- Bridges (Steel)
  - Canadian Des Moines Steel Co.
  - Hamilton Bridge Works Co.
  - Horton Steel Works
  - McGregor & McIntyre
  - MacKinnon Steel Company
  - Sarnia Bridge Company
- Buckets
  - **Canadian Austin Machinery**
  - Canadian Link-Belt Co.
  - Canadian Mead-Morrison Co.
  - Hopkins & Co., Ltd., F. H.
  - Mussens Limited
  - Orton & Steinbrenner Co.
- Building Materials
  - Britnell, Limited
  - Canadian Link-Belt Co.
  - Oakley & Sons Geo.
  - Rogers Supply Co.
  - **Standard White Lime Co.**
  - Vitrified Clay Pipe Publicity Bureau
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  - Dominion Wire Rope Co., Ltd
  - Greening Wire Co., B.
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  - Standard Underground Cable Co., of Canada Ltd.
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  - MacKinnon Steel Company
  - Mussens Limited
- Cars—Freight
  - **Canadian Equipment Co.**
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  - Canada Iron Foundries
- Carrier Systems
  - Canadian Link-Belt Co.
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  - Canada Iron Foundries
  - Hepburn, Ltd., John T.
  - H. Mueller Mfg. Co., Limited
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  - H. Mueller Mfg. Co., Limited
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  - Britnell & Company
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  - Cement Gun Co.
- Cement Hardener
  - Canada Cement Co.
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  - Spielman Agencies Regd.
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  - Dom. Tar & Chemical Co., Ltd.
  - Imperial Oil Company, Ltd.
  - Spielman Agencies Regd.
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  - **Canadian Austin Machinery**
  - Canadian Blower & Forge Co.
  - London Concrete Machry. Co.
- Chains
  - Canadian Link-Belt Co.
- Chemists
  - Canadian Inspection & Testing Laboratories
- Chimneys
  - Horton Steel Works
  - Summerhays & Co., Wm.
  - Vitrified Clay Pipe Publicity Bureau
- Clamshell Buckets
  - **Canadian Austin Machinery**
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  - **Canadian Equipment Co.**
- Coal Crushers
  - Orton & Steinbrenner Co.
- Coal Handling Apparatus
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  - Canadian Mead-Morrison Co.
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  - London Concrete Machinery Go
- Concrete Carts
  - London Concrete Machinery Co.
- Concrete Culvert Pipes
  - Dominion Concrete Company
- Concrete Machinery
  - **Canadian Austin Machinery**
  - Koehring Co., of Canada
  - London Concrete Machinery Co
  - Mussens Limited
- Concrete Mixers and Appliances
  - **Canadian Austin Machinery**
  - Hopkins & Co., Ltd., F. H.
  - Koehring Co., of Canada
  - Mussens Limited
  - Turnbull & Co., Harvard
- Concrete Hardener
  - Spielman Agencies Regd.
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  - **Canadian Johns-Manville Co.**
  - Conduits Company, Limited
  - National Conduit Company
  - Vitrified Clay Pipe Publicity Bureau
- Conduits (Wooden Pressure Creosoted
  - Pacific Coast Pipe Co.
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  - McLeod, Norman Ltd.
  - Patterson Electric Co.
  - Thomson Bros.
  - Provincial Contracting Co.
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  - United States Fidelity & Guaranty Company
- Contractors' Plant & Supplies
  - **Ball Engine Co.**
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  - **Canadian Equipment Co.**
  - Canadian Link-Belt Co.
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  - Dake Engine Co.
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  - Gartshore, John J.
  - General Products Co.
  - Hamilton Bridge Works Co.
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  - Koehring Co., of Canada
  - London Concrete Machry. Co.
  - McGovern, T. J.
  - Mussens Limited
  - Orton & Steinbrenner Co.
  - Thew Shovel Co.
  - Turnbull & Co., Harvard
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  - **Canadian Austin Machinery**
  - Mussens Limited
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  - **Ball Engine Co.**
  - **Canadian Austin Machinery**
  - **Canadian Equipment Co.**
  - Canadian Link-Belt Co.
  - Canadian Mead-Morrison Co.
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  - Hepburn, Ltd., John T.
  - Koehring Co., of Canada
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  - Orton & Steinbrenner Co.
- Creosote Oils
  - Barrett Company, Ltd.
  - Dom. Tar & Chemical Co., Ltd.
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  - Canada Crushed Stone
  - Crushed Stone, Limited
  - **Queenston Quarries Co.**
  - Rogers Supply Co.
  - Standard Lime Co.
  - **Standard White Lime Co.**
- Crushers (Stone and Rock)
  - Dominion Road Machry. Co.
  - Hopkins & Co., Ltd., F. H.
  - London Concrete Machry. Co
  - Mussens Limited
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  - **Oakley, Geo. & Son**
  - Queenston Quarries Co.
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  - **Shunk Mfg. Co.**
- Damp Proof Coating
  - Barrett Company, Ltd.
  - Imperial Oil Company, Ltd.
  - Dom. Tar & Chemical Co., Ltd.
- Derricks and Derrick Fittings
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  - **Clyde Iron Works Sales Co.**
  - Hepburn, Ltd., John T.
  - Hopkins & Co., Ltd., F. H.
  - **Mussens Limited**
  - Turnbull & Co., Harvard
- Ditchers
  - Buckeye Traction Ditcher Co.
  - **Canadian Austin Machinery**
  - **Mussens Limited**
- Ditching Machines
  - **Ball Engine Co.**
  - Buckeye Traction Ditcher Co.
  - **Canadian Austin Machinery**
  - Erie Steam Shovel Co.
  - **Mussens Limited**
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  - Pannill Door Co.
- Drafting Supplies
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- Drag Line Excavators
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  - **Canadian Equipment Co.**
  - Koehring Co., of Canada
  - **Mussens Limited**
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  - **Canadian Blower & Forge Co**
- Dredges
  - **Canadian Equipment Co.**
  - Canadian Mead-Morrison Co
  - Hopkins & Co., Ltd., F. H.
  - **Mussens Limited**
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  - **Dominion Truck Equipment Co**
- Dump Cars, Wheels etc.
  - **Canadian Equipment Co.**
  - Hopkins & Co., Ltd., F. H.
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  - Mussens Limited
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  - Canadian Blower & Forge Co.
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  - Sturtevant, B. F. & Co.
- Electric Water Systems
  - H. Mueller Mfg. Co., Limited
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  - Spielman Agencies Regd.
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  - Ormsby Company, A. B.
- Elevators
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  - Otis-Fensom Elevator Co.
  - Turnbull Elevator Company
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  - **American Enameled Brick & Tile Company**
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  - Canadian Blower & Forge Co.
  - **Clyde Iron Works Sales Co.**
  - Hopkins & Co., Ltd., F. H.
  - Inglis Company, John
  - Laurie & Lamb
  - Le Roy Company
  - Sterling Engine Co.
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- Engines—Swinging
  - Canadian Mead-Morrison Co.
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  - Chipman & Power
  - Hunt & Co., Robt. W.
  - Milton Hersey Company
  - **Lea, R. S. & W. S.**
- Engineers' Supplies
  - Geo. Vincent
- **Excavators**
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  - Engineering & Machine Works. Co.
  - Erie Steam Shovel Co.
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  - Koehring Co., of Canada
  - Lumsden Engineering & Contracting Co.
  - Monighan Machine Co.
  - Mussens Limited
  - Thew Shovel Co.
- Exhausters
  - Sturtevant, B. F. & Co.
- Exhaust Heads
  - Canadian Blower & Forge Co
  - Sturtevant, B. F. & Co.

(Continued on page 8)

FLOORS THAT PROTECT!

NATCO FLOOR ARCHES protect the architect, builder and owner—

(1) Against Costly Delays in erecting.

NATCO Floor Arches require a minimum of form work that can be used almost indefinitely.

Centering is quickly erected by labourers and can be removed in a few hours.

NATCO Floor Arches are speedily installed and can be laid in colder weather than other forms of floor construction.

They produce a flat ceiling with a solid surface for plastering.

Fire risk during construction is greatly reduced.

(2) Against Costly Defects in the completed structure

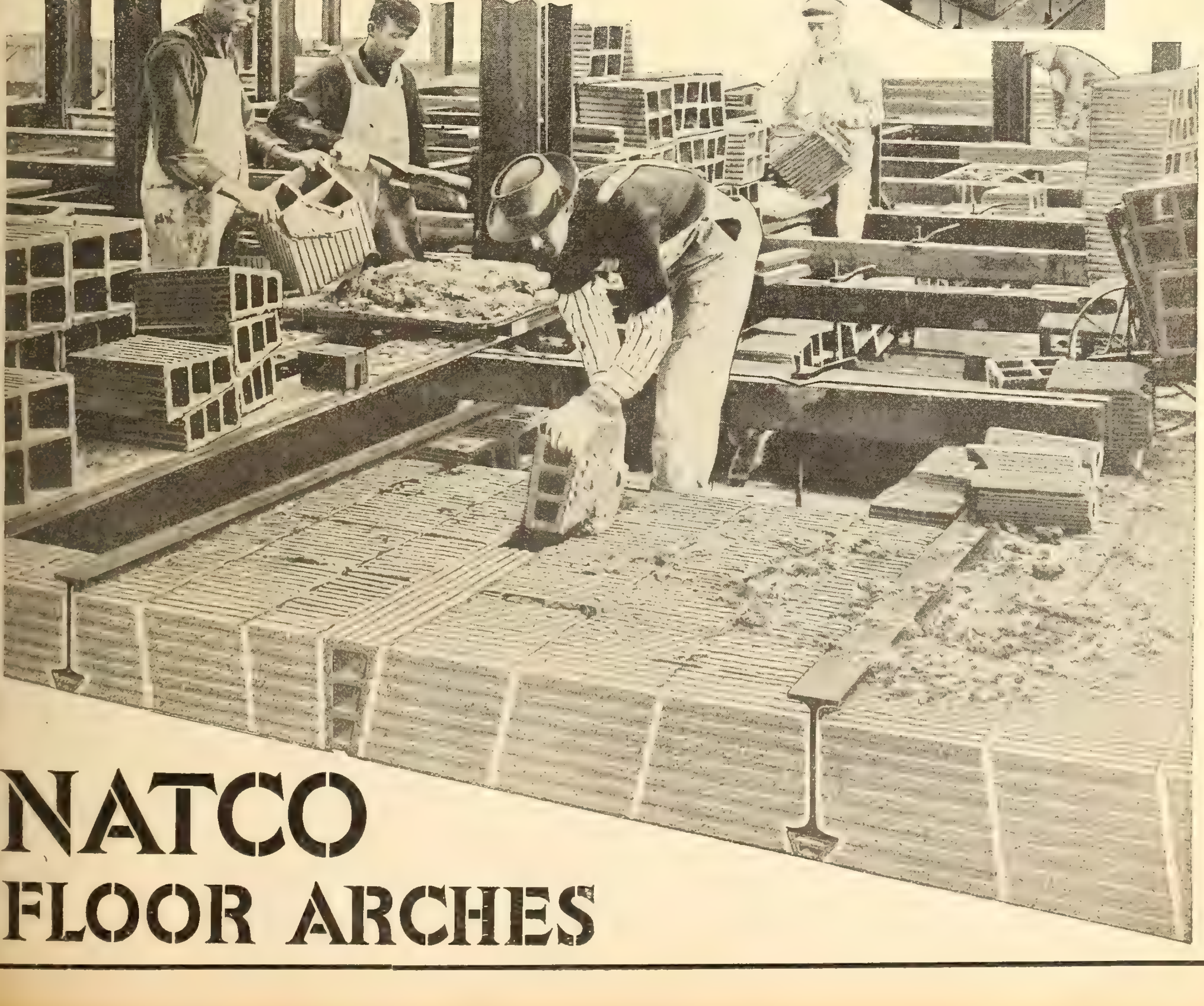
NATCO Floor Arches are enormously strong. They are sound proof, vermin proof and really and truly fire proof.

In buildings like the Dominion Bank, shown in the accompanying illustration, where protection, comfort and safety are of paramount importance, NATCO Floor Arches are almost universally used.

Dominion Bank Building, Toronto

Darling & Pearson, Architects
Can. Stewart Co., Ltd.
Cont rs,

NATIONAL FIRE PROOFING COMPANY
OF CANADA, LIMITED
DOMINION BANK BUILDING, TORONTO
FACTORY: HAMILTON, ONT.



NATCO FLOOR ARCHES

CLASSIFIED INDEX TO ADVERTISEMENTS—Continued

- Fans
  - Canadian Blower and Forge Co
  - Sturtevant, B. F. & Co
- Fans, Disc
  - Sturtevant, B. F. & Co.
- Fans, Multivane
  - Sturtevant, B. F. & Co
- Fans, Propeller
  - Sturtevant, B. F. & Co.
- Fans, Silentvane
  - Sturtevant, B. F. & Co.
- Fibre Board
  - [illegible] Manley
- **Filters, Water**
  - Laurie & Lamb
- **Fireproofing**
  - National Fireproofing Co.
- **Fireproof Doors and Windows**
  - **Mussens Limited**
  - **Ormsby Company, A. B.**
- **Fire Escapes**
  - Canadian Des Moines Steel Co.
  - McGregor & McIntyre
  - Dennis Wire & Iron Works Co
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- **Fittings**
  - Crane, Limited
  - H. Mueller Mfg. Co., Limited
  - **York Manufacturing Co.**
- **Fixing Devices**
  - Inventions Limited.
  - **Rawlplug Co. of Canada**
- **Flag Poles**
  - MacKinnon Steel Company
  - McGregor & McIntyre
- **Flooring Materials**
  - Imperial Oil Company, Ltd.
  - National Fireproofing Co.
  - Vitrified Clay Pipe Publicity Bureau
- **Forges**
  - Canadian Blower and Forge Co
- **Furnaces**
  - H. Mueller Mfg. Co., Limited
- **Gantry and Cantilever Cranes**
  - Orton & Steinbrenner Co.
- **Gasoline Engines**
  - London Concrete Machry. Co.
- **Glass**
  - **Consolidated Plate Glass Co.**
- **Grader Blades**
  - **Shunk Mfg. Co**
- Gravel
  - Allen Bros.
  - Paris Sand & Gravel Co.
  - Rogers Supply Co
- **Gymnasium Apparatus**
  - Coffey, J. G.
- Hardwood **Flooring**
  - Eaton & Sons, J. R
- Hauling Contractors
  - Angstrom & Verochio
  - Lumsden Engineering & Transport Co.
- **Heating Apparatus**
  - Canadian Blower and Forge Co
  - Crane, Limited
  - Sturtevant, B. F. & Co.
- Hoists, Electric
  - **Canadian Austin Machinery**
  - Canadian Link-Belt Co
  - **Clyde Iron Works, Sales Co.**
- **Hoists (Truck)**
  - **Dominion Truck Equipment Co**
- **Hoisting Apparatus**
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  - Canadian Mead-Morrison Co
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  - Hopkins & Company, F. H.
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  - Gartshore-Thompson Pipe Co.
  - McAvity & Sons, T.
  - Hepburn, Ltd., John T.
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  - Melville Quarry Co.
  - Standard Lime Co
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  - York Manufacturing Co
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  - **Canadian Austin Machinery**
  - **Canadian Equipment Co.**
  - Hopkins & Company, F. H
  - MacKinnon Steel Company
  - Mussens Limited
- **Inspection Engineers**
  - Canadian Inspection & Testing Laboratories
  - Hunt & Co., Robt. W.
  - Milton Hersey Company
- **Insulating Compounds**
  - Dom. Tar & Chemical Co., Ltd
  - Imperial Oil Company, Ltd.
  - Spielman Agencies Regd.
  - Standard Underground Cable Co., of Canada Ltd.
- **Jib Cranes (all kinds)**
  - Hamilton Bridge Works Co
- Joist Hangers
  - Hamilton Bridge Works Co
- Kilns
  - Canadian Blower and Forge Co
  - Horton Steel Works
  - MacKinnon Steel Company
- Lead Pencils
  - American Lead Pencil Co.
- Lime
  - Standard Lime Co.
- **Hydrated Lime**
  - **Standard White Lime Co.**
- Lockers (Clothes)
  - Canada Wire & Iron Goods Co
- Locomotive Cranes
  - **Ball Engine Co.**
  - **Canadian Austin Machinery**
  - **Canadian Equipment Co.**
  - Canadian Link-Belt Co.
  - Erie Steam Shovel Co.
  - General Products Co.
  - Hopkins & Co., Ltd., F. H.
  - Koehring Co., of Canada
  - **McGovern, T. J.**
  - Mussens Limited
  - Orton & Steinbrenner Co
- Locomotive **Steam**
  - **Canadian Equipment Co.**
- Locomotive **Gasoline and Storage Battery**
  - **Canadian Austin Machinery**
  - Koehring Co. of Canada
- Marble
  - Oakley & Sons, Geo
- Metal Lath
  - General Products Ltd.
  - Ormsby Company A. B
- Meters
  - Builders Iron Foundry
- **Mine Cars**
  - **Philip Gies Foundry**
- Motors
  - Sturtevant, B. F. & Co.
- Oil Tanks
  - Canadian Des Moines Steel Co
  - Hamilton Bridge Works Co
  - Hamilton Co., Wm.
  - **Horton Steel Works**
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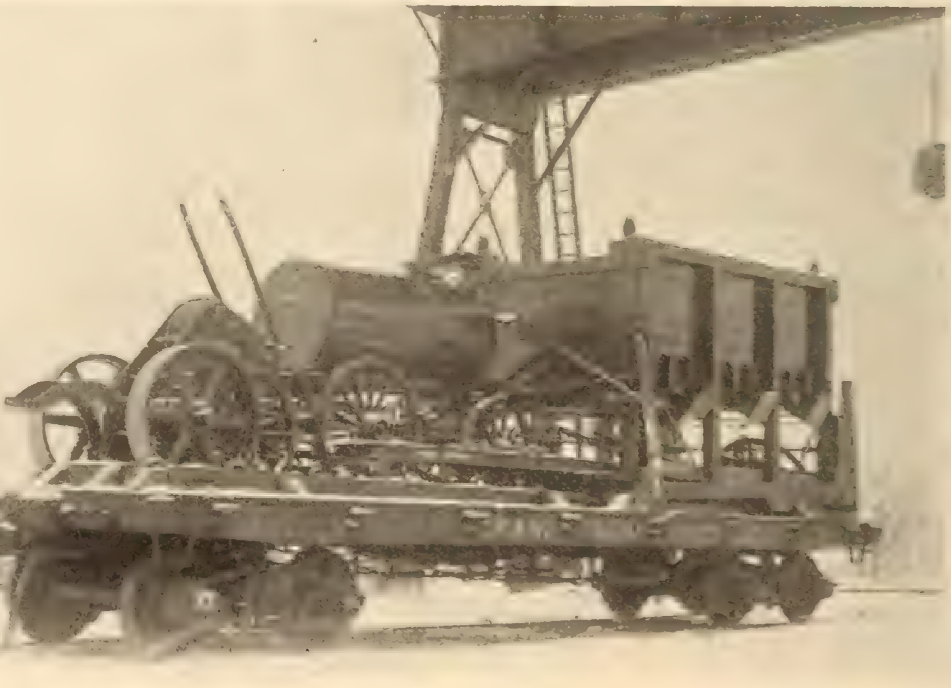

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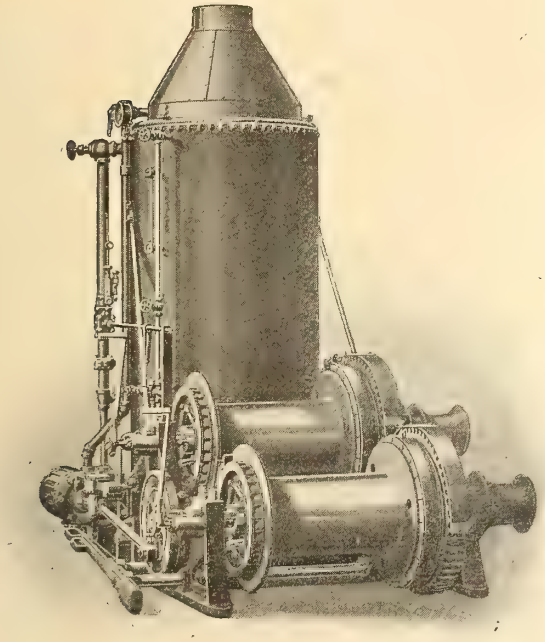

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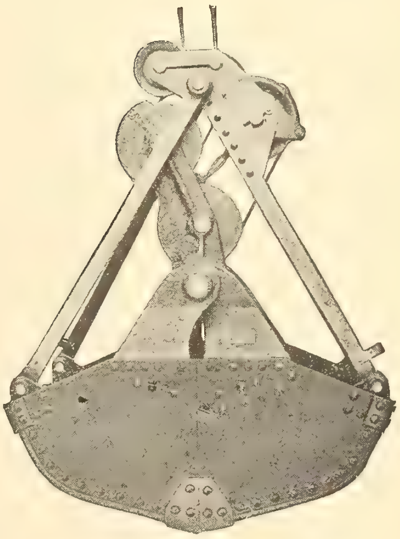

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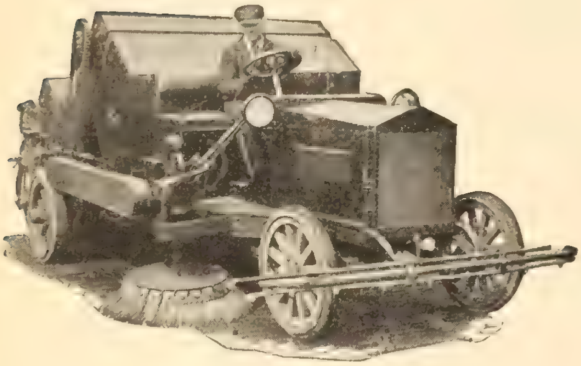

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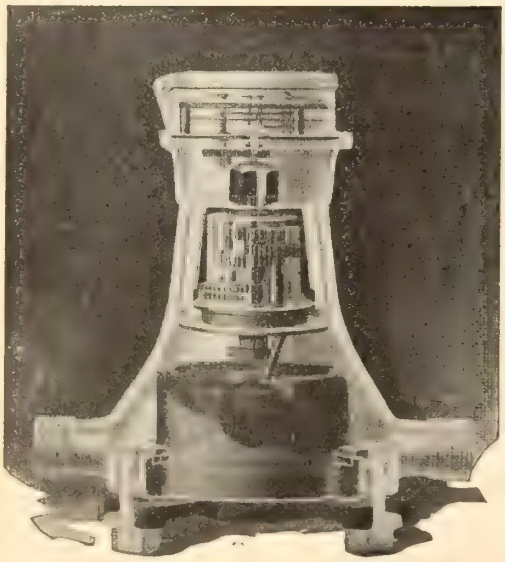

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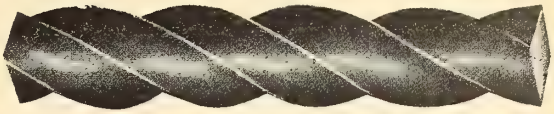

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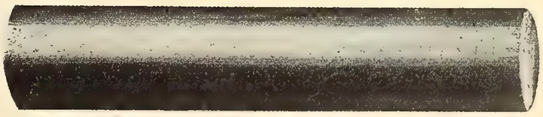

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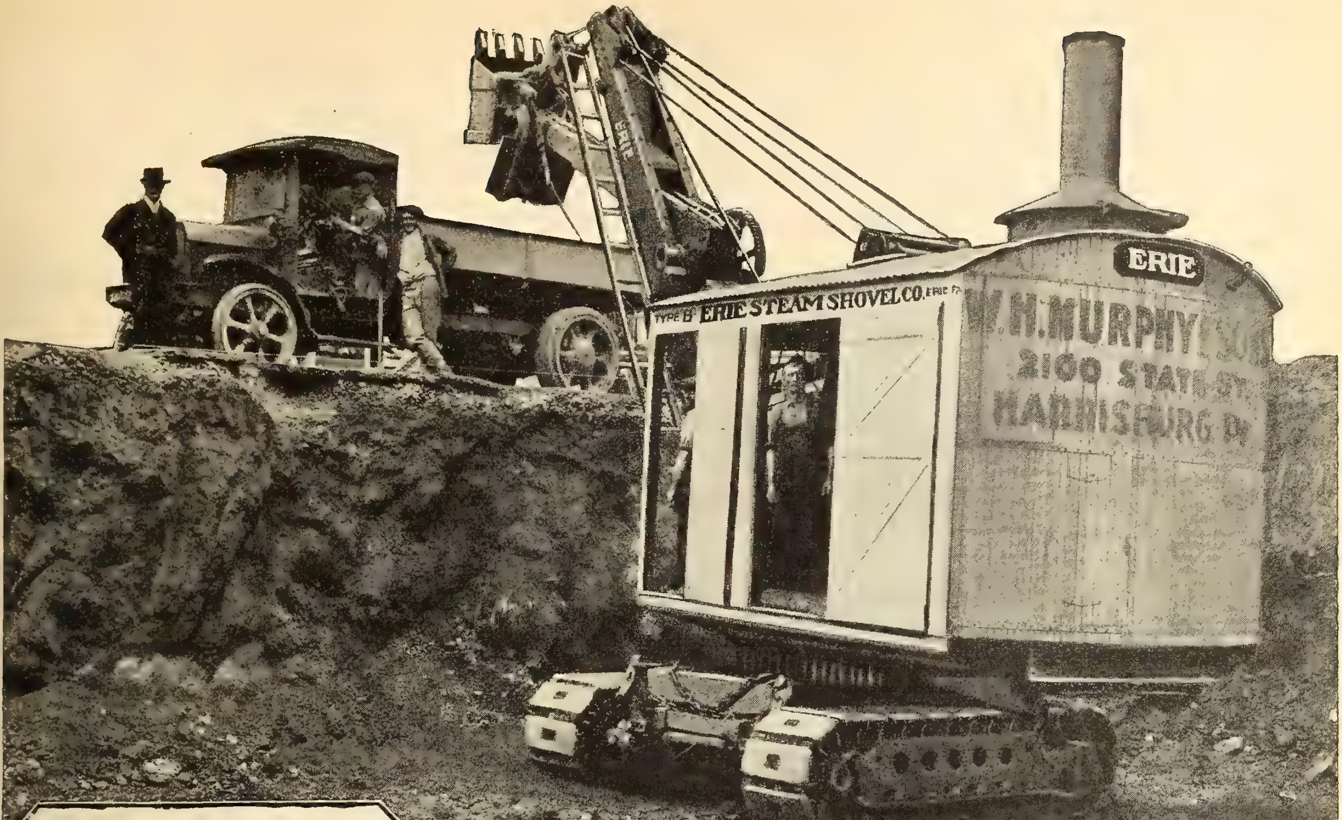

"All material loaded on the bank,"
writes Mr. Murphy,
"and in some places, this cellar cut ran 16 ft. deep"—

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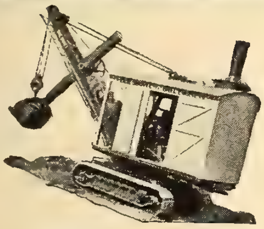

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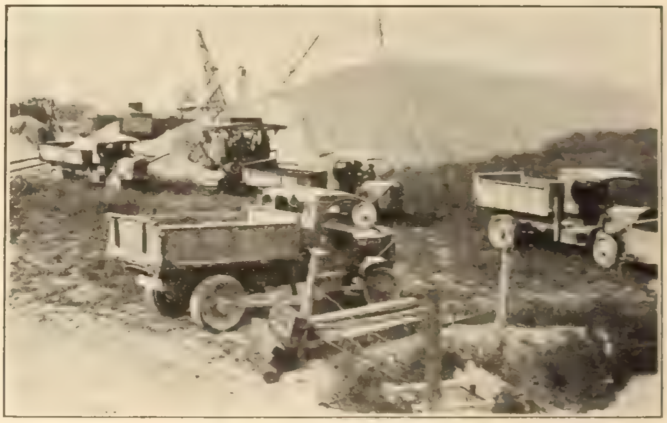

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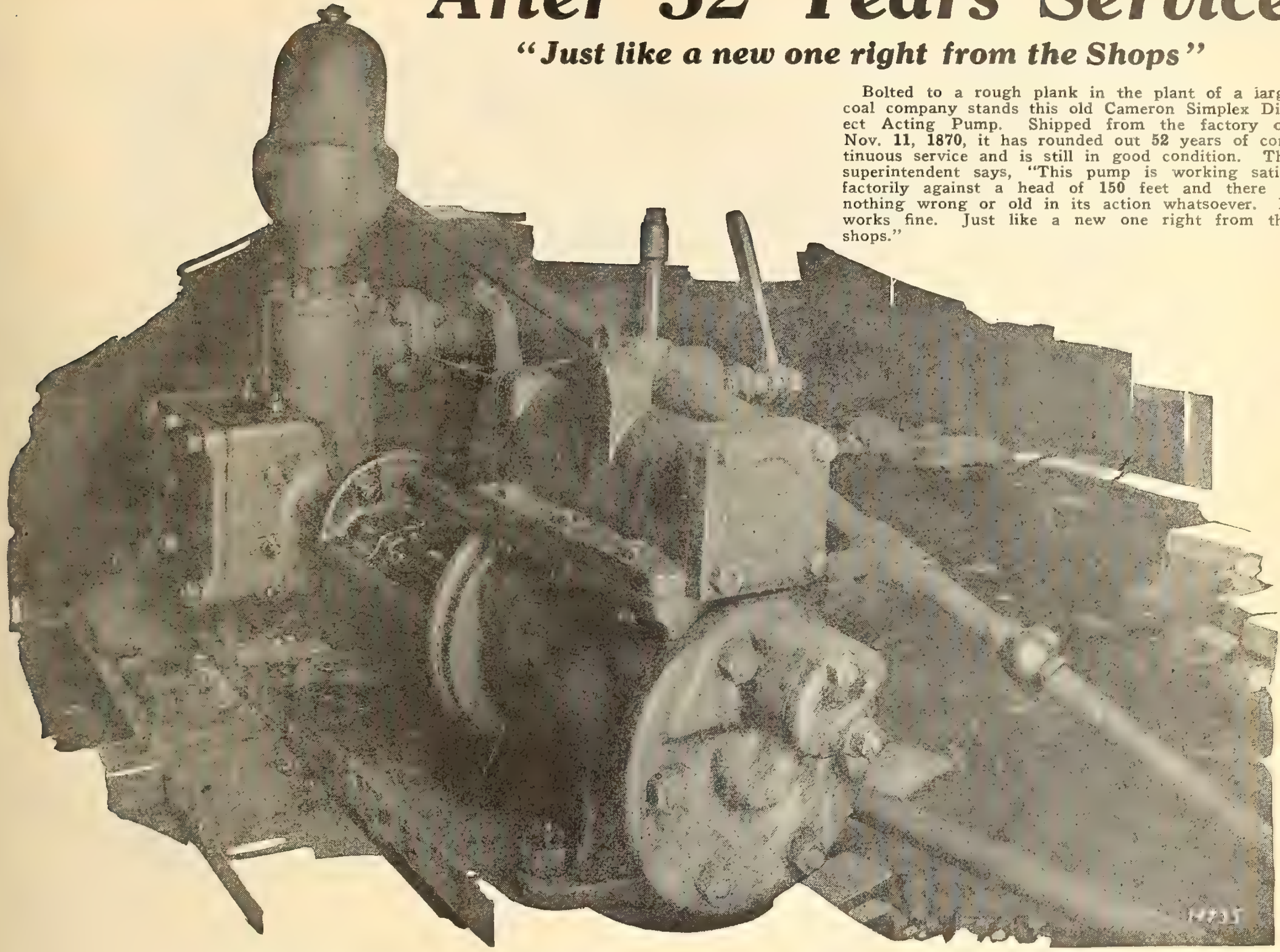

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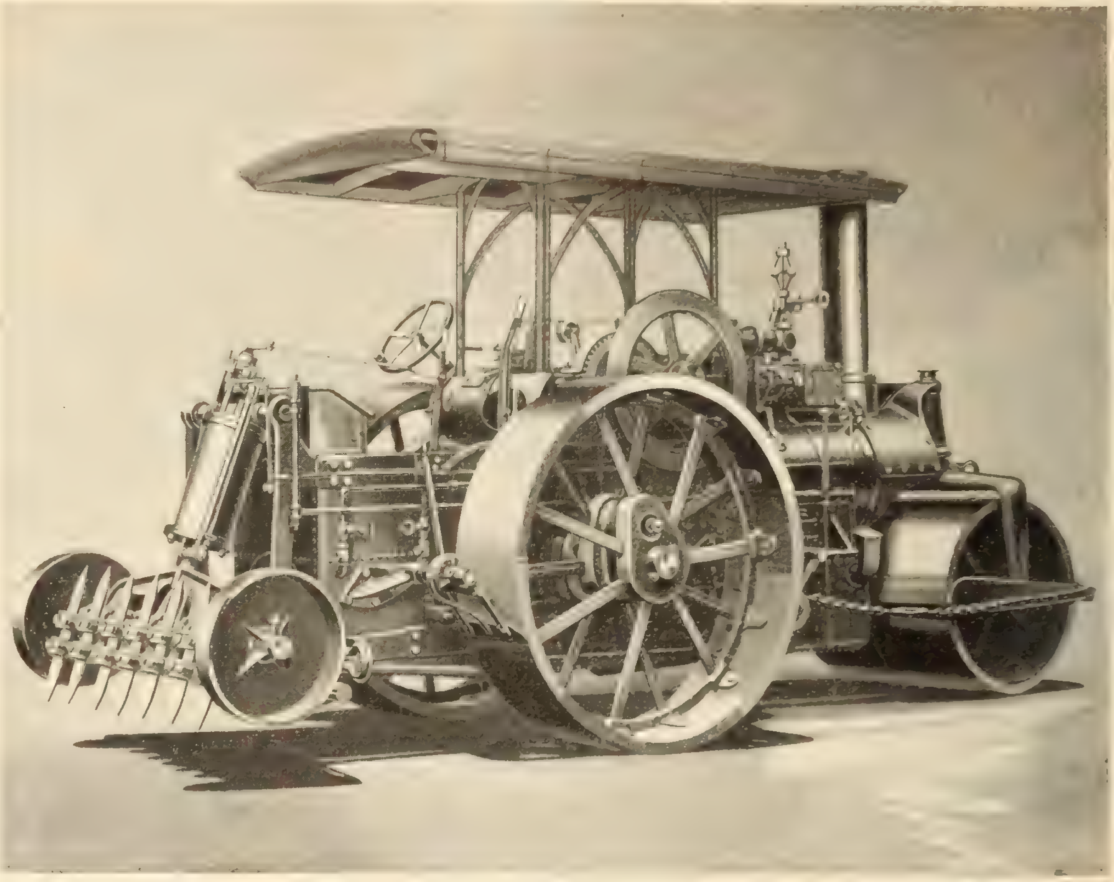

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The Big Problem of the Construction Industry

At the Building Industries Convention in Quebec last week the papers that come in for most discussion—particularly after the sessions—were those of Messrs. Pigott and Anglin—the former on the need of a revival of the apprenticeship system and the latter on the need—allied to it—of year-round employment in the building trades. It is something more than a coincidence—though doubtless each was acting without knowledge of the other—that the Master Painters' Convention in Toronto during the same week also voiced the urgent need of more skilled painters—and urged the re-introduction of the apprentice system.

A study of present-day conditions, as disclosed by Mr. Pigott's paper, indicates that the apprentice, in any one of the building trades, is a rara avis—is practically extinct. The few skilled workmen that have been added during the past ten years have come from the Old Country. There is not sufficient attractiveness in these trades to induce young men to enter them and, in addition, the labor unions discourage apprentices believing that scarcity of skilled mechanics means higher wages. It is a criticial situation for the general public who, of course, pay for it in delays and high building costs.

The present situation is that, during the summer, there is a shortage of labor and, during the winter, a shortage of employment. Lengthening the employment year would go a long way towards solving the problem. It would increase the annual income of the mechanic in proportion and enable him to accept a lower average wage. It would assist the factories and supply houses to maintain a more even load-factor and so reduce their overhead and tend to reduce the cost of building materials. It would enable the contractor to keep his equipment and organization on an earning basis for just that much longer. It would relieve, to a considerable degree, the winter unemployment.

Mr. Anglin said that cessation of work during the winter is, in considerable measure, a matter of habit—the public believe it is not wise to go ahead and they delay. The public must be educated to think otherwise.

But the need for young men coming on to take the places of those dropping out will still always be urgent. Some form of apprenticeship must be arranged. And this presupposes that the work is sufficiently attractive and remunerative to out-bid other jobs that offer. Guarantees of year-round work would go a long way in this direction.

Labor's False Teachings

The recent annual meeting of the Engineering Institute of Canada, in Montreal, afforded the retiring president Mr. J. G. Sullivan, an opportunity to express his viewpoint on the success of labor organizations in general. Mr. Sullivan is reported as follows:

"What are the objects of labor organizations? To better the conditions of the working man. Do they live up to this object? My answer is emphatically no. By false teaching that all men are equal, by teaching that the organized laborer is producing from two to twenty times what he gets paid for, and by teaching that there is sufficient capital in the world for all to live in comfort and leisure, if it were equally divided, they have created a feeling of unrest, hatred and distrust in the minds of their members. By teaching and putting into practice the false doctrine that the less a man will do, the more jobs there will be for others, by restricting the kinds of work a man may do, and by restricting the time he may work and the amount of work he may do in a given time, they have increased the cost of production to such a point that they themselves, as well as the rest of the world, are scarcely able to make both ends meet."

Mr. Sullivan has put the matter plainly and, we believe, accurately. The test of the whole thing lies in the present condition of the working man. Is he better off than he was formerly? It is difficult to see in what way. He makes more money but he has to pay higher prices for everything so that his surplus is no greater, and is often less, than formerly. He works fewer hours in some cases but is the extra time being spent profitably? He works at much less pressure and, at best, must carry away with him each night the feeling that he is less of a man for having done only a part day's work. To our way of thinking two types of men are being slowly evolved by the labor organizations, neither of which is good for the world. (1) a swaggering type, entirely selfish, devoid of any power of discrimination and (2) what might be called a cringing type—the man who had fine instincts and a real sense of manhood and duty but has been bulldozed by the union leaders until he is a mere dog of a man.

There is no doubt that the original aim of the unions was never in this direction. The betterment of the condition of the working man was entirely commendable. There is no evidence, however, that such a goal has been reached or that the movement is in that direction. Indeed, it would appear that labor as a general term is held in less real respect today than at any other period in history.

Like Unto a Garden—

The Association of Canadian Building and Construction Industries, Rightly Cultivated, Will Continue to Thrive Until it is a Powerful Force in National Prosperity

From the presidential address of J. B. Carswell at the Fifth Construction Conference of the A.C.B.C.I., at Quebec

What have we been doing during the past four years to warrant our existence? When I think of this Association somehow my mind goes back to my own little perennial garden at home. I have my little garden laid out in a circle, everything radiating from one little tree planted exactly in the geometric center of the whole layout. It is not a big garden, but some day I hope to have time to cultivate the garden right out to the extreme limits, and just as in this Association, so in my garden, there are times of the year when there is not much work to do, and other seasons of the year when there is more work than I can well manage.

Now the true principles of gardening are these: You must first till your soil and then you select your plants, and you see that they are good healthy plants; you must select the proper soil for each individual plant, and you must select the right location. Then when you have set your plant in the soil, some will say that you have nothing more to do, that Providence does the rest.

Planting Ideas

Isn't it just the same in this Association? What we are doing is planting ideas, planting principles which will grow day by day, and incidentally night by night. You all remember the advice of Baillie Nichol Jarvie to his son to "Plant a tree for it will be growing while you are sleeping." It is just the same thing with this Association. Every action that it takes is another plant put into our garden, but if these plants are going to thrive, you know that we must keep weeding our garden, for if we do not, the coarse foreign ideas will choke out our plants and soon we will have nothing but weeds.

Did you ever notice in your gardening operations that there comes a time in the late Spring after you have put the seeds in and before anything is showing through the ground; a time when you are living simply in hope. You are hoping that Providence will send the warm rain and sunshine in due and proper proportion so that your little plants and seedlings will break through the soil. This, I think, is just where our Association is today. We are only a few years old; we are really in the Springtime of our existence. Our garden may be a little bare, but we have great hopes that in the very near future it will become a thing of beauty and satisfaction, not only to ourselves, but to everyone who looks upon it.

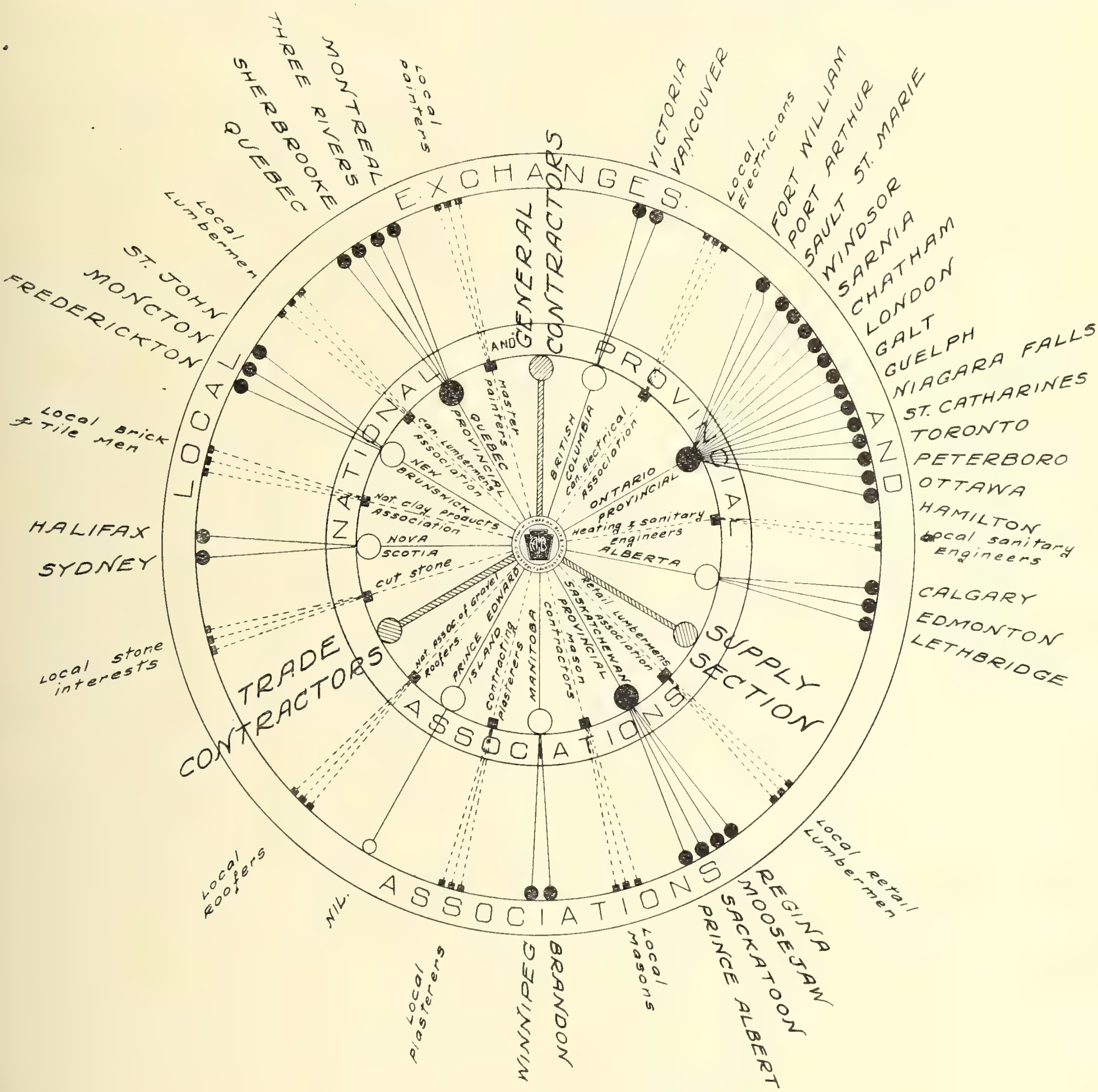
But when we look back on the work of the last four years, we may find that perhaps after all our garden is not quite so bare as we thought. We have, for instance, the Standard Contract Form. It is today scattering its blossoms all over Canada. We have another very healthy plant called Government Recognition; a plant which is growing stronger year by year. We have another plant, rather delicate, one that needs very careful attention, but one which is very necessary if our garden is to be properly rounded out and completed. It is called the Code of Ethics.

During the past year our hard working gardener, Mr. Reilly, assisted by all the sub-gardeners of your Executive, have been endeavoring to start growing in this garden a great number of other little plants. I would like to take this opportunity of saying that we cannot appreciate too much the services of our head gardener, Mr. Reilly. It is not an exaggeration to say that during the past year there has scarcely a single day gone past without my getting in the mail every morning one, two, three or half a dozen letters from Mr. Reilly, all requiring prompt attention, and all pertaining to the general service which Mr. Reilly is furnishing to the individual members of this Association, and not only to the individual members but to the Branch Organizations as well. He has been supplying continually information, so much so that he is rapidly becoming the walking encyclopedia of the building industry.

Activities of the Head Gardener

I don't know if you quite realize how active Mr. Reilly has been in attending at the Dominion House when any matter of interest to us as employers was being discussed. When the House is in session, Mr. Reilly never lets a day pass without going over the agenda and finding out if his presence is required, and it is very interesting to note that every time he finds himself attending meetings in the House, side by side with him are the representatives of Labor, always keenly on the alert, active in their lobbying and watching out for any move that might be detrimental to their own peculiar interests.

On the question of freight rates, you will remember at our last Conference we discussed this matter very thoroughly, and Mr. Reilly followed this up by attending all the Parliamentary Committee meetings, and reported the proceedings that interested the Executive from time to time. We were represented by our Secretary also on the Employment Service Council and the Dominion Government Conference on Unemployment. The Lien Laws came up for consideration. The Retail Lumbermen's Association approached us and in conjunction with the Provincial Association of Ontario, we sent forward to Vancouver certain recommendations to the Committee on Uniformity of Legislation. This movement on Lien Laws, it is interesting to note, was followed shortly after by a similar movement in Winnipeg and in Edmonton.



An ideal organization scheme for the A.C.B.C.I.

This Conference is going to have something further to say on the question of Immigration and Apprenticeship, both of which subjects I have already referred to. Mr. Reilly is keeping us very closely in touch with the Immigration Department in Ottawa, and he will be able to supply you with some real information on the subject when the Committee gets to work.

An Emblem of Our Occupation

But to get back to this garden of ours. When the flowers begin to bloom, one of the pleasantest things I know of is to go out in the morning and pluck one of your prettiest rosebuds and stick it in your coat, then when you get down town everyone knows that you are a gardener. We have our gardening emblem in the shape of a seal for our note paper and a stencil for our construction signs, which everyone of us should be using, so that the Public will know that we at least are taking our part in the work of guiding this great industry of ours along the paths of clean business and justice to the public whom we serve.

There is another aspect of gardening on which I would like to dwell for a moment, and that is the fact that gardening takes you out in the open, and not only so, but as soon as you start to garden you probably find that the man over the fence is doing the same thing, and very soon you get to know your neighbor as you never knew him before. You will doubtless come to the conclusion that all the petty gossip that runs up and down the street about this man and the next man is all nonsense when you meet him face to face and find that he is interested in the same problems as you are. And who will have the courage to attempt to appraise the value of a true friend, more especially a friend whose interests both personal and in a business way are your interests. One could almost preach a sermon on this aspect of Association, but I am simply leaving the thought with you for what it is worth.

The Garden Layout

Now lastly, I want to come to the real secret of successful gardening. I told you in the first place my own little garden was laid out in a circle with a little garden lawn in the middle and a tree planted in the center of the lawn, and if you will allow me to mix my metaphors, I would like to call this tree, the Tree of Basic Principles as laid down by the A.C.B.C.I. In order to make your garden a success, a garden that will be recognized as a real garden by everyone who looks upon it, you have got to have planted in there every variety of plant that you can find, and in order to discuss this aspect intelligently I have prepared a drawing of this Ideal Garden of mine.

In the center of this big circle you will see the crest of the A.C.B.C.I. Then radiating from this center we have first of all the three main branches of this Association as at present constituted. The General Contractors Section, The Trade Contractors Section and the Supply Section. Next we come to the nine Provinces of Canada, and you will find in the inner of my two concentric circles, nine Provincial Associations, three of which at present exist in Quebec, Ontario and Saskatchewan. The other six locations are still to be filled in.

Radiating again from these nine Provincial Associations, we find the 33 existing Builders Exchanges throughout the length and breadth of Canada, all located on the outer circle. This represents the first system of our lines of defence.

Then we come to the second system again radiating from the common point of interest, the A.B.C.C.I., and we find all of the National bodies which are interested in the construction industry.

Radiating again to the outer circle from these National bodies, I have indicated all of the local branches which are at present affiliated or linked up in some way with the National interest.

Each and every one of these bodies indicated on this chart, together with a great many more that are not indicated on the chart, for I am here simply trying to show an idea and I do not suggest that all of the bodies which should be represented in this great family circle are shown in the diagram; I simply put down the first names that came to my mind,—each and everyone of these bodies have one common interest.

I am not a Rotarian, nor have I much chance of ever becoming one as long as I live in Toronto, unless a certain other member of this Association should die or go to prison before me, but you will notice the similarity between my chart and the smybol of Rotary.

After all, when we get right back to the foundation, it is the same idea, the great circle of defence, first line and second line trenches and Headquarters in the center; a great system of defence to protect and mother the welfare of this industry, and at the same time, a great circle of service to the Public at large.

To make my meaning clearer, perhaps I can take you back for a moment to the days of the earliest settlers on the Prairies. You remember what they did when they were attacked by the Indians. Their women and children and all their interests that were near and dear to them were placed in the center and they drove their wagons around in a great circle, and thus fought their battles against the outside sinister interests.

This is only a reiteration of the idea expressed at the first organizing Conference of this Association, but during the past year I have felt that we were rather losing sight of the real aims of this Association, and that we were progressing in rather a haphazard way.

To get back for a minute to the three main spokes of our inside circle; you will see that if we carry this programme out to the letter, the General Contractors Section, the Trade Section and the Supply Section will be individually as sections the active factors in this Association, and the activities of the Association itself, or perhaps I might say, of the National Council and the Executive and the President and the Secretary, would be more or less passive than active; in other words, they would only act when called upon by some of the outer working interests so to do.

Lines of Communication

We can look upon this chart in another way and consider these lines on the chart as lines of communication, bringing ideas and activities into the center of the circle so that from there they are radiated out again to other interests working in other localities and other sections of the industry.

Before this Conference closes, I am going to ask you to discuss this chart so that we can have the views of every member of the Association. We have written to a great many of these kindred Associations which are indicated on the inside circle; we have asked some of them to send a representative to this meeting to join in this discussion. Personally, I feel very strongly that this is the star to which we have got to hitch our wagon, but at the same time, I do not wish to convey the impression that such an organization of this kind can be built up over night. It will take time and patience to do it, but just as the other activities of this Association are today beginning to show fruit after several years of patience, so I hope in the near future that this idea will gather strength, until finally we have an organization of which we will all be proud; an organization which will be complete in itself; to which the various governmental bodies can go for official advice and counsel, to which the public can appeal for fair play; an organization which can carry out national ideas and deal with our big Dominion wide problems in a comprehensive manner; an organization to which I trust our friends of the Labor party can look for real cooperation in the working out of our common problems, so that they, and we, and the public whom we both serve, will be happy in the knowledge that this industry has planted a garden of which it is justly proud.

They Fail to Realize

There are some men in this industry who take

(Continued on page 151)

The Fifth Construction Conference of the Association of Canadian Building and Construction Industries

Successful Meeting in Quebec City—Apprenticeship and Seasonal Employment Questions were Chief Topics of Interest—Action Wanted on the Development of Uniform Cost System—Display of Building Materials

Quebec city was the meeting ground of the contractors of Canada last week when the fifth annual conference of the Association of Canadian Building and Construction Industries was held at the Chateau Frontenac, from February 6 to 9. The meetings were well attended and the delegates were representative of the construction industry from Halifax to as far west as Saskatoon. The registration was about eighty.

The convention was opened with a lunch meeting, presided over by the president. Mr. E. G. Brosseau, Mayor Samson, and Mr. E. J. Welch, president of the local Board of Trade were on hand to welcome the guests. After the toast of the King had been honored, Mayor Samson was introduced and in a short speech extended a welcome to the ancient capital of Canada. He added that he hoped their visit would prove profitable in a business sense, and pointed out the opportunities and the advanages that the city of Quebec afforded for the establishment of new industries. Labor was sane, plentiful and efficient as well as comparatively cheap.

Mr. A. J. Welch, president of the Board of Trade was next introduced by the chairman, and also extended a welcome to the delegates on behalf of the Board. He referred in his speech to the building trade in Quebec and the construction work that had been carried out in the last few years in regard to the erection of dwellings. He understood from the contractors that their building activities had not resulted in the profits which they had expected. He referred to the high rents and cost of heating dwellings and other buildings, and said this feature of the cost of living should be brought to the notice of the Government for remedy, the same as the investigations that were made into other features of living. He again referred to building and the need of small houses. In connection with financing he said that a guarantee association had been organized to meet this matter and forecasted that there would be a future development of the building of small houses.

Mr. James Mackie, Vice-President of the Association of Canadian Building and Construction Industries replied on behalf of the delegates.

The first business meeting of the Association was called in the afternoon of Feb. 6. The president, Mr. James B. Carswell was in the chair. The secretary, Mr. Reilly submitted his annual report, which gave a full and clear acccount of the activities during the year 1922 of the Association with which was affiliated from thirty to forty organizations engaged in the building industries. He dwelt on a conference held with the General Construction Association of America at Detroit, which resulted in a better understanding on matters affecting both countries. Legislation activities in connection with parliamentary measures were referred to, as also matters of publicity, immigration, the lack of skilled workmen in the building trades, the cost of building and the service the Association rendered to the community at large. Mr. Reilly reviewed the economic situation with the prospects for the trade and the features of progress made in 1922.

The financial report was presented by the honorary treasurer, E. G. M. Cape.

Vice-President Mr. James Mackie, of Winnipeg then gave a very interesting talk on conditions in the west and quoted statistics of the past in comparison to the last few years. He discussed at some length the progress made in the various provinces, and spoke optimistically of the future.

* * *

Two very timely and important papers were delivered at the morning session of Wednesday the 7th. These were "Seasonal Employment in the Construction Industry," by J. P. Anglin, and "The Shortage of Mechanics and the Cure," by J. M. Pigott. After the delivery of Mr. Anglin's review of the seasonal nature of construction and his suggestions regarding the lengthening of the building season. Mr. McFarren of the Interprovincial Brick Co., Toronto, expressed the viewpoint of a supplier of building materials, stating that had it not been for the fact that his firm had not made brick in the winter time they would have lost money. He cited here the difficulties in the way of producing brick in cold weather had gradually been overcome until at the present time production was within 5 per cent of normal and the cost was probably also within 5 per cent. The reason for winter-produced brick costing a little more, according to Mr. McFarren, was because contractors did not buy in the winter time and the brick had to be stored instead of sold. Mr. McFarren also verified Mr. Anglin's opinion regarding the desirability of winter construction by outlining building operations which the Interprovincial Brick Co., are now carrying out. Records showed that the costs, although pertaining to a particularly difficult type of work for winter operations—kiln building—were very close to those of summer work of a similar character.

Mr. J. S. Schryburt, of the Dominion Bureau of Statistics stressed the importance of the subject of Mr. Anglin's paper and suggested that his department of the government could offer co-operation that would be very helpful in solving the seasonal unemployment question.

Mr. Crane, of Ottawa, felt that the first problem in connection with seasonal activity that demanded attention was the education of the public. The fact that the construction season is short was not due to the contractors inasmuch as it had been well demonstrated that they were able and willing to carry out work in the winter time. Rather did the difficulty lie with the public who had to be educated to the desirability of offering their contracts earlier in the season.

Mr. J. M. Pigott indicated that giving work was preferable to handing out money for the relief of the unemployed and he urged contractors to impress public bodies with the desirability of making available during the winter time the work which they carry out.

After this discussion the conference approved a motion to have Mr. Anglin's paper referred to the committee on seasonal employment for action.

The paper dealing with the "shortage of mechanics and the cure" by J. M. Pigott was regarded as a very important contribution that deserved serious study on the part of the conference. For that reason it was referred to the committee on apprenticeship, Mr. Anglin first commenting on the importance of the question of training mechanics. He said that the solution of this problem would ultimately solve the difficulties of construction. He referred to the joint conference of employers and employees held in Ottawa in May 1921, indicating the better spirit of co-operation and understanding that was developed thereby, especially with regard to this apprenticeship problem. An apprenticeship board in each community was Mr. Anglin's idea of what must ultimately be done.

At noon luncheon the association was honored by the presence of Hon. L. A. Taschereau, premier of Quebec, who had been returned victorious in the general elections of the day previous. In speaking to the assembly Mr. Taschereau outlined the important construction activities that had taken place and were about to take place in the province, particularly in connection with water power development. He referred to Quebec's interest in the promotion of her natural resources and also to her sane and harmonious labor element. Finally, he offered the co-operation of his government in promoting legislation that would be of benefit to the construction industry, in such connections as apprenticeship and seasonal unemployment.

Through the courtesy of the Anglin-Norcross Co., the delegates were shown through the new extensions to the Chateau Frontenac, the nature of the work having been first explained by a member of the construction staff. The tour of this very extensive project revealed some extremely interesting and unique developments of the building art. It was, furthermore, a splendid example of construction unhampered by particularly severe weather conditions.

At the afternoon session, Mr. E. G. M. Cape read a very well prepared paper entitled "Construction Activity in Canada" which was largely explanatory of a chart developed by Mr. Cape, depicting the trend in construction contracts, cost of living, labor wages and building material prices over the period 1913-1922. Considerable discussion followed with regard to the trend of building costs.

A suggestion was put forward to have on the executive—besides a first vice-president—two second vice-presidents, one representative of the west and one of the east. As this entailed a change in the by-laws it was decided on a motion to let conditions stand as at present until the executive have had an opportunity of going over the by-laws and recommending changes before the next annual convention.

Another suggestion which found favor was the appointment of small localized standing committees to deal with current questions so that they could frequently meet to discuss the problems within their jurisdiction. This was left with the executive since the by-laws give them the power to appoint such committees.

* * *

The third day of the conference, Thursday, Feb. 8, developed into a very important session with interest-creating papers and a visit to the Quebec bridge. The industrial census schedule and the work the government is doing in collecting and collating statistics were described in a paper by J. A. Schryburt of the Dominion Bureau of Statistics. It outlined the efforts of this department in attempting to assemble accurate and timely data concerning the industries of Canada, among which contracting took an important place. Mr. Schryburt stressed the need of co-operation on the part of contractors and speaking for his department, offered their services in connection with the compilation of any statistical material the industry stood in need of.

"Why and How to Find Costs," was the subject of a very illuminating and well thought out address by R. J. Fuller, of the John V. Gray Construction Co. Mr. Fuller had been chosen along with Mr. Hagelin, of the Carswell Construction Co., Toronto, at last year's meeting to be a standing committee to develop a standard cost-finding system for the association. Mr. Fuller's address was explained by him to be in the nature of a tentative report, inasmuch as it was impossible for a committee of only two to outline a scheme that should be considered final and binding on an association of diversified interests. His remarks were prefaced by a paper prepared by Mr. Hagelin and which explains some of the essential factors involved in the development of a cost system. Mr. Fuller elaborated upon this by further explaining the "why" of costs and suggesting a scheme that would form the basis of further development by an adequate committee. He characterized the construction industry as extremely wasteful, to remedy which condition a knowledge of costs was required. He pictured the firm that used guessing methods in its estimating, describing its worth after many years of effort as zero. Conservatism was deprecated as it was stated that no contractor could advance in his calling without experimentation, along sane lines, of course, and not over exploited. As to the reasons for the desirability of a cost-keeping system Mr. Fuller gave four: (1) Such a system would indicate where economies could be effected; (2) it offered a check on personnel; (3) it minimized losses when such were imminent, and (4) it formed a basis for estimating future work.

The first requirement in the application of a cost system was stated to be the preparation of a set of quantity survey rules. It was useless in his opinion to attempt to apply cost-keeping ideas until some standard practice was developed with regard to the taking off of quantities. Mr. Fuller then explained the "job overhead" sheet, listing the items that he regarded as necessary of inclusion under that heading. The next stage in his scheme was the taking off of quantities and the pricing of them, followed by the estimate summary. Then the estimate must be analyzed for the cost man so that he will be able to work out his costs in sympathy with the estimate. Mr. Fuller, in summing up, claimed that two sets of forms were necessary: One to apply to the large business and one applicable to contractors with only small organizations.

The address was referred to the committee on standard practices, for action.

* * *

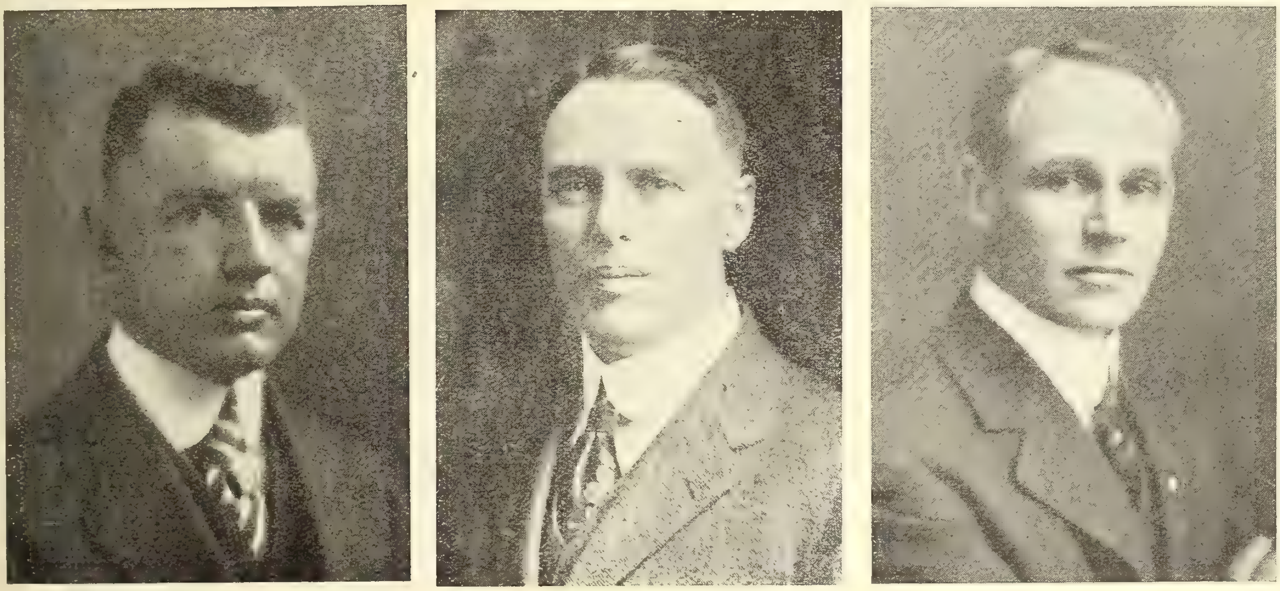
An illustrated talk on the construction of the Quebec bridge was given by Mr. George Porter of the Canadian Bridge Co., Walkerville, Ont. His slides very completely indicated the nature of the design and erection of the structure. After lunch a special train conveyed the delegates to the bridge for a personal inspection.

At the luncheon hour Hon. Athanese David, provincial secretary of Quebec was the special speaker. His brilliant address on Quebec's ideals and attainments found ready favor with the members of the association.

The evening was taken up with a smoker under the auspices of the Quebec Builders' Exchange, at which a very entertaining program was provided.

* * *

On Friday Mr. W. R. Mattson of Babson's Statistical Agency, Wellesley Hills, Mass., gave an interesting talk on the outlook for 1923. His address will be referred to at some length in the next issue.



Officers of the A. C. B. C. I.

J. M. Pigott, President J. Clark Reilly, Secretary John V. Gray, 2nd vice-president

The committee reports were then presented as follows:

Report of Labor Committee

Your committee on labor, after reviewing the work of last year, and in the light of that experience, wish to re-affirm the basic principles as laid down in the able report presented by the labor committee at our last conference in Hamilton.

We feel that in these principles we have a firm foundation on which to build for the coming years, and do not desire to make any changes.

Further, we believe that clauses three and four of last year's report, dealing with the question of agreements, and wages and results, should again be incorporated in this Report.

Your committee feels that the future horizon is brighter than it has been for some time, and that the construction industry, with reasonable care, is entering on a period of reasonable prosperity.

In regard to the question of wages and hours, the committee recommends that both of these matters should be left to the local associations to deal with, taking into consideration conditions as they exist in each locality.

The report was adopted.

* * *

Report of Committee on Apprenticeship and Seasonal Employment

Your committee on apprenticeship and seasonal empoyment have had several meetings where consideration was given to these important questions and the paper presented at this Conference on them.

It was finally agreed that time would not permit the study necessary to work out an adequate program for obtaining the results desired. It was therefore decided to instruct the executive to appoint standing committees each composed of three members, located so that frequent meetings may be held and that these committees be given power to add to their number.

This joint committee feels that the subject of shortage of building mechanics is of such vital importance to the country at the present time that the Dominion government should be approached by the executive for the purpose of arranging a conference under government auspices of all the different interests directly concerned and that seasonal employment which is bound up in the same question in many respects, and is of vital importance in itself should be dealt with at the same time.

This committee feels, however, that to these questions must be added the question of immigration. At best the proposed apprenticeship scheme after years of work will only slowly correct the building mechanics shortage. In other words, by succeeding in our apprenticeship plans we may hold Canada as far as the building industry is concerned, from slipping back, but if Canada is to develop, then we must open our gates to a reasonable extent. We should ask for a change in our immigration policy.

It is also recommended by this committee that in addition to approaching the Dominion government similar action should be taken in the different provinces, and that the standing committees act with them in an advisory way so as to correlate the work as far as possible.

The Retiring President

J. B. Carswell

* * *

Report on Standard Practices

The committee on standard practices reported as follows:

Discussion took place on last year's report. It was very gratifying to the new committee to note that the standard general contract form has been adopted and is in working order, forms are printed and are available to members of this association.

Referring to contract forms as between general contractor and sub-mechanical trades, this committee recommends that the executive council follow this up with a view to having a suitable form adopted at the next conference. This committee also recommends the executive council to name a committee of one trade contractor, one supply man and one general contractor to collect present any new information with a view to getting up suitable form for adoption.

The committee requests that the present code of standard practices be printed and sent to all members. The committee also recommends that if financially possible the executive council employ a cost engineer to get up a standard system of quantity survey, estimating and cost-keeping, suitable for both extensive and smaller operators. This is to be ready for submission to the committee of the next conference.

Adopted with the amendment that the executive go over and revise, if necessary, the code of standard practices before publication and distribution.

Mr. R. J. Fuller moved that the executive be instructed to arrange a conference of cost men and estimators of the association to discuss ways and means of putting into effect a standard quantity surveying, estimating and cost-keeping system.

* * *

Officers for 1923

The report of the nominating committee, which was unanimously adopted, named the following officers for 1923: President, Joseph M. Pigott, Hamilton; past president, J. B. Carswell, Toronto; 1st vice-president, James Mackie, Winnipeg; 2nd vice-president, John V. Gray, Toronto; hon. secretary, John Grieve, Montreal; hon. treasurer, F. B. McFarren, Montreal; representative from general contractors' section, S. E. Dinsmore, Windsor; representative from trade contractors' section, R. Fitzsimons, Hamilton; representative from manufacturing and supply section, H. J. Mero, Walkerville.

* * *

The manufacturing and supply section of the association were responsible for a display of construction materials, which were arranged in booths in two large rooms on the Terrace floor of the Chateau Frontenac. The following were the firms that exhibited.

Pannill Door Co.	Toronto.
Interlocking Tile Co.	Toronto.
Bishopric Manufacturing Co.	Ottawa.
Dominion Radiator Co.	Montreal.
Dennis Wire & Iron Works	London.
Pedlar People, Limited	Oshawa.
Interprovincial Brick Co.	Toronto.
Trussed Concrete Steel Co.	Walkerville.
Canadian Metal & Steel Products Co.	Toronto.
Dominion Paint Works	Walkerville.
Contract Record	Toronto.
Citadel Brick Co.	Quebec.
London Guarantee & Accident Co.	Toronto.
Koehring Company	Toronto.
Canadian Benedict Stone Co.	Montreal.

The Honorary Treasurer

F. B. McFarren

(Continued on page 161)

Removing the "Peak Load" of Construction

The Existing Seasonal Nature of Building Operations Has a Serious Effect on Labor Supply, Unemployment and Construction Costs—Some Remedy Must be Found

By J. P. ANGLIN
Of Anglin-Norcross Ltd., Montreal;Past President of the A.C.B.C.I.

Before the Fifth Construction Conference of the A.C.B.C.I at Quebec

The subject which will be dealt with in this paper is one of the most important questions facing our industry. It has been forced to the front in all parts of America owing to serious periods of unemployment occurring each year, and also owing to the equally serious periods, which we may call the "Peak Loads" in our industry, which recur annually from shortage of labor caused by the Fall rush of construction.

These two extremes, which vary from unemployment at one period to over employment at another period in the same year, recurring as they do practically every year under present conditions, have forced all thoughtful men in our Industry, as well as those in other lines affected by the Construction Industry, to ask the question "Can nothing be done towards spreading the volume of construction carried out in any one year, equally over the entire year, and so reduce unemployment, as well as avoid the peak load or labor scarcity?

Others , feeling less responsible, will ask the question "Why spend time on this subject?" We have always had these periods to a greater or less degree and always will have them, no matter what means may be adopted of regulating construction?" No doubt most of us will agree that there is no panacea or complete cure for this ill which affects our Industry so vitally. On the other hand we have neglected this phase of our business too long and must almost feel ashamed to admit that we are now forced to study the question and adopt means which will reduce these abnormal seasonal conditions.

Common to all Industries

Of course we realize that all Industries have this trouble to a greater or less degree. Perhaps the two most outstanding industries which have their marked periods of unemployment and usually a demand for labor in the busy season which exceeds the supply, are lumbering, almost wholly a winter business, and agriculture, almost entirely a summer business. Fortunately these two industries offset one another to some extent, and labor can transfer from one to the other. This has been the history of these two great lines of activity from the early days of development in trade and commerce in Canada. Before the War railroading also influenced conditions in the labor market very considerably, but owing to lack of railroad construction, this influence is not now felt as in former days.

From the standpoint of building costs, we are forced to realize that there are two great needs in our industry if we are to prevent a serious increase in costs of building and construction during the days that are immediately ahead of us:—

1. We must endeavor to adopt ways and means to keep all building mechanics as steadily employed as possible.
2. We must, at the same time, put into action an aggressive apprenticeship plan

It is very fitting, therefore, that the question of apprenticeship is to be taken up by Mr. Piggott immediately following this paper on "Seasonal Employment." The big question before us is—"How can we bring about regulation or equalization of the volume of construction business carried on throughout the various seasons of the year? In other words what can we do to reduce Seasonal unemployment and avoid peak load shortages?

We, of course, appreciate the fact that this is no new question, and many of us have been making statements both in public and private for several years that some study of the problem leading to action to control and regulate construction would have to be adopted sooner or later. It is only since the war however, that a serious scientific study has begun. Students of the question everywhere realize that high costs are often due to the acute period of shortage of mechanics and labor in the construction industry which recurs annually. This shortage is the cause of abnormally high wages in many trades in the big centres of America. Owners and builders having rush work on hand compete with each other in open market for labor as well as materials; wages often soar to three and four times the standard rate. No industry can stand this condition and continue to flourish.

No One Group to Blame

From the most superficial study of the question one is soon led to appreciate the fact that this peak load condition in our industry cannot be laid at the door of the engineer, the contractor or of labor. It is the natural result of a great number of causes which have been overlooked in the past, and which concern owners of property, manufacturers of building material, financing and loaning companies, manufacturers in general, and in fact the entire community just as much as those directly engaged in the industry.

In days gone by when costs were comparatively low, we neglected to study this question because it did not assume such a serious aspect, but under present conditions when cost of living is high, when mechanics are forced to consider their annual income and when building costs again threaten to increase, we are compelled in self-defence to apply ourselves to this question vigorously. If we fail to work out some improvement in this condition we will not be doing our duty by the community, or by the particular business of our choice.

The Building Congress

Fortunately for us a great deal of study has been given to this question throughout America, and we have the benefit of the study of others to guide us in the consideration of this question. Boards have been formed in many large centres, and more are being formed in other places to investigate conditions and suggest remedies. These boards in various centres are usually known by the name "Building Congress," and already we have available the results of considerable study on the part of the New Yory Building Congress, Philadelphia Building Congress and the Boston Building Congress. These Building Congresses in various centres, for reasons which have already been mentioned, are composed of representatives from the various allied interests, as well as from the construction industry. Naturally, to cover the ground thoroughly, the Congress should be composed of representatives of local Chambers of Commerce, of Boards of Trade, of Manufacturers' Associations, Building material men, of Real Estate Boards, of Financial Interests concerned, as well as of Labor, Contractor, Architectural and Engineering bodies.

The general reasons for having such a widely representative body compose the local building congress is because it is realized that the whole community is interested and would be benefitted by any improvements adopted, and also because one of the first requisites in order to have any general plan adopted is, that public opinion should be influenced, and it is only by such a widely representative body giving its mark of approval to suggested remedies, that any real change can be brought about. A Board composed along these lines also takes the question out of the realm of purely selfish interests, and guarantees to the public that the interests of the whole community are being considered and not simply the benefit of a single group.

No doubt it will very shortly be felt also that no one community even can adopt methods without consultation with other communities, as so much construction work is carried on outside of the big centres and very frequently influences the situation. If real effective means are to be adopted, they must include all of the construction work of the country and not simply the work carried on in each of the large centres.

Nothing Yet in Canada

It is unfortunate that in Canada, where we have the greatest need for a study of this question owing to the great length of our winters, no concerted effort has yet been made to reduce the great loss which the seasonal nature of our work involves.

In the United States the various boards head up in an American Construction Council with headquarters in Washington. Of course this construction council deals with all big questions affecting the construction industry as a whole throughout the United States. Their purpose is briefly stated as follows.—

"With the desire to place the Construction Industry on a high plane of integrity and efficiency and to correlate the efforts towards betterment made by the existing organizations, all the component parts of the industry are joining in the formation of the American Construction Council, a conference association representative of the whole industry and dedicated to the improvement of the service which the Construction Industry renders to the Community, the State, and the Nation."

They claim that the Construction Industry in the United States employs about 2,000,000 people and one of their slogans is "A single industry which absorbs over 50% of our National savings." Two of the important problems receiving the immediate attention of this Construction Council are:—

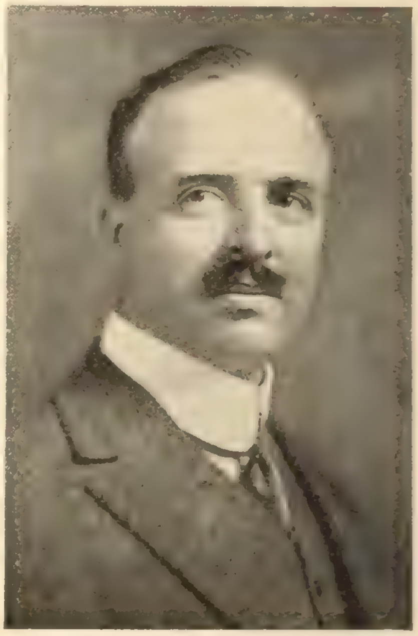
1. A stabilization of the Construction Industry to mitigate the evils of seasonal employment and the trade migration of labor.
2. A reduction of the national shortage of building mechanics and the establishment of the necessary apprenticeship system.

I believe that our Association of Canadian Building & Construction Industry should take the initiative in arranging the formation of a Canadian Construction Council along similar lines to that of the American Construction Council, because it is only by some such means that the great problems of our industry can be solved.

Those of you who believe in the importance of this and allied subjects, should take the pains to read the four articles—under the heading "Lost time in Construction" by C. S. Hill, which appeared in the Engineering News-Record, October, 1922, Vol. 89, numbers 14, 15, 16 and 17. For the many who will not take the time I am forced to reproduce some of the statements, as well as the ideas therein expressed.

Average Employee Works Third of Time

It is commonly stated that the average number of working days of the construction employee during the year does not exceed 100 out of a possible 300. Engineering and construction therefore, is only about 30% efficient in its utilization of time. So completely widespread is the short season practice in construction, that it is the accepted custom in every locality, and we are forced to believe that a reform in this direction, to be effective, must be undertaken by **all** large organizations in addition to the Associations of Engineers and Contractors. (Under "Engineers" of course would be included Architects and others who design construction work).


Mr. J. P. Anglin

Cessation of construction in Winter is prompted by the fact that cold weather hinders certain processes and makes much of the work uncomfortable, and in some instances adds to the cost of construction. Both engineers and contractors have come to believe that physical difficulties, as well as increased costs stand in the way. Habit has developed out of practice, and most owners, engineers and builders are not inclined to work in winter because it requires an upset of habit. The custom of not carrying on construction in winter has led the industries which supply construction materials, brick, crushed stone, gravel, etc., also to discontinue or curtail production during the idle season.

Owners are led to believe that construction is discontinued in winter because it is physically impracticable. Wherever the value of winter construction is certain however, means of carrying it on are found without especial difficulty. Readjustment of practice for the industry as a whole can be accomplished by showing that it pays generally to continue work in winter instead of letting plant and capital remain idle and the owners be delayed in getting the use of the improvement. To obtain this result, concerted action is required.

A General Study

A general study must, of course, be carried on by engineering, construction and manufacturing organizations, and should follow the following procedure:—

1. Determination of the kinds of work which lend themselves to winter performance.
2. Determination of methods and equipment for conducting construction in cold weather.
3. Determination of costs of the various classes of winter work as compared with similar work in the summer season.
4. Determination of the limit where extra cost of winter work ceases to be profitable.

There are many other delays mentioned in the above series of articles which should be considered and dealt with, but the scope of this paper will not permit. A properly organized body, however, should consider all matters which tend to cause unemployment or intermittent employment in our industry. In passing, however, it should be pointed out that the only cure for the periodic shortage in some material which causes unemployment is the adoption of the method of spreading the consumption over a longer period of the year, and as a result, of course, the spreading of the demand would naturally extend the production period.

Many delays are also caused by the Engineers restricting the kind or quality of materials, which limits the sources of supply and often introduces **long hauls.** There follows from this, delay in construction due to insufficient or irregular transportation.

Those of you who may be engaged in a study of this question should obtain the "Labor Review" of October 1921, published by the U.S. Department of Labor, and study carefully the article on page 98, regarding the "Effect of Irregular Employment on Income in the Building Trades." This article gives in detail figures regarding the average annual income of the building trade worker in Philadelphia, based on an average of 200 working days in the year, or one day lost out of every three by every building mechanic. In this article the statement is made that in the building trades one of the reasons for the constant drive for higher hourly wages is to maintain an adequate annual income and to offset the loss due to intermittent occupation. Following this it is stated that "This intermittent occupation is no doubt one of the chief reasons for the fact that young men are no longer entering apprenticeship and learning construction trades from the bottom up, with a view to spending their lives in such work."

Examples of Economic Waste

Building Congresses in the various centres were referred to in the beginning of this paper, and the formation of these Congresses gives promise of bringing about co-operation in reducing seasonal unemployment, in the training of apprentices and by wiping out wasteful practices of all kinds in the industry. It is, of course, as yet too early to judge the effect of these organizations, as they have not been in operation for a sufficient length of time, but no doubt the agitation carried on by these organizations will result in the early letting of contracts in all lines of construction, and by the encouragement given to owners of property to consider these questions more carefully when timing their building and construction operations. As an illustration of economic waste, we have at this moment two glaring examples in Montreal:—

1. A large public provincial building, on which considerable money has already been expended is now lying idle where the question of employment has been entirely ignored. At this moment the Province would be saving money if the various contracts had been let several months ago, and winter employment given to many stone cutters, structural steel workers and others. This work will now no doubt be carried forward and help to create a serious situation, which will greatly accentuate the shortage in building mechanics when the peak load occurs next Fall.

2. A large addition to the premises of one of our strongest financial companies was commenced in the early season of 1922. The foundations have been completed on this work, as was also the case on the building first referred to. Those in charge of this company placed a contract for structural steel in ample time to guarantee its prompt fabrication and erection. The same authorities, however, neglected to order the cut stone in the early season of 1922 and thus be in a position to continue their construction without loss of time. The net result is that this entire structure, so far as work on the site is concerned, will stand idle during the entire winter, when a great deal of progress could easily have been made had a logical programme been carried out. This not only results in a great deal of lost time, but also lost money, owing to the large expenditure standing idle. Further it helps to accentuate the unemployment in the building trades during this winter season, and will no doubt combine with case number one above mentioned, in creating labor shortage in the later Summer and early Fall of 1923.

These two cases are merely cited to show how a responsible body of representative citizens, appointed by all of the prominent civic organizations, might, by a proper publicity of the facts, influence property owners, whether public or private, to consider these vital questions, and so help to check the resulting increased cost to themselves as well as to the community at large.

Montreal Groups Getting Together

It is worthy of note that two meetings have already been held in the Montreal Board of Trade, at which representatives of most of the public bodies in the City have been present, to consider this question of seasonal employment, and to decide what action, if any, can be taken to improve existing conditions. The work of Building Congresses in New York, Boston and Philadelphia was briefly reviewed, and it was felt an effort should be made to improve conditions in Montreal. A representative committee has been appointed, which includes a representative from each of the following bodies:—

Builder's Exchange, Engineering Institute, Building Trades Council, Architectural Society, National

Catholic Unions, Chambre de Commerce, Board of Trade Manufacturers' Association, Real Estate Men.

This committee has been requested to make a study of the problem and report with definite suggestions to another meeting of representatives from all of the interested Montreal organizations. The ideas placed before this committee were obtained partly from "Bulletin No. 3" July 1922, issued by the New York Building Congress concerning seasonal employment in the building trades. Some of the recommendations contained in this "Bulletin" were also published in the "Contract Record" of December 13th 1922, page 1174, and suggested as a means of reducing costs and eliminating unemployment periods, the following:—

Recommendations

1. Establish a wider range of rental period dates.
2. Regulate Government, State, City, Religious and Educational Building construction so that it will come during the low period of employment wherever possible.
3. Regulate the construction of new buildings and additions that are erected for owner's pre-arranged occupancy without regard for investment returns so that it will come during the low period of employment.
4. Encourage beginning work on new construction March 1st instead of the customary date of May 1st, thereby bringing its labor demand two months ahead of the demand peak with a greater supply available.
5. Plan maintenance and repair work so that it will come during the season for which there is a low demand for the labor involved, subject to emergency conditions that must be considered.
6. Wherever possible adopt the demand for "inside" and "outside" work to the labor available as indicated on the labor chart analysis.

The suggestion is offered that this can be accomplished through the following propaganda:—

1. Distribution of this Bulletin amongst the membership of the various associations that have to do with the Building Industry.
2. Publicity in newspapers, magazines and trade journals that will reach the public generally.
3. Discussions and resolutions in associations such as the Chamber of Commerce, the Merchants Association, the Association of various Manufacturers, Women's Clubs, Fraternal Organizations, Labor Unions, etc., so as to reach the average owner.
4. Send communications for consideration to various governments, state, and municipal boards, and to the governing boards of religious, educational, philanthropic and other institutions that have building requirements to meet from time to time.
5. Send communications to public and private school authorities encouraging the assignment of this topic for discussion, research, debate and investigation by students.

Hard to Get Specific Data

Before closing this paper mention should be made of the fact that specific data, concerning the number of days lost by individual mechanics, who might be considered as first class mechanics in their trades, has been collected and tabulated. A number of cases were dealt with in the monthly "Labor Review" of May 1921 of the U.S. Department of Labor, page 107, where records of employment of bricklayers and others in Philadelphia are discussed. Naturally there are not very many mechanics who keep such records accurately from year to year, but from a study of material gathered and tabulated from 1909 to 1920, the average day's work was obtained. It is a safe assumption that mechanics of the class who would make such tabulations are likely to rank very high in their trade and lose less time than the average. It is stated in this article that:

"The greatest difficulty in determining the number of days worked by bricklayers or anyone else in the building trades arises from the fact that so few workers in these trades work continously for the same man for an entire season. A most interesting illustration of this is furnished by the record of one man covering a period of 5-1/2 years which shows that during that time he worked for 76 different contractors and was hired 107 times.

This particular mechanic in 1920 worked for eight different contractors and was hired thirteen times, his best previous record being in 1913, when he worked for 9 different contractors and was hired 12 times. His maximum was reached in 1915 when he worked for 18 different contractors and was hired 28 times. The same article, after deducting for lost time due to various causes, gives the average possible days' work in the year as 182. It is stated that part of the lost time in Philadelphia is no doubt due to the rigid building ordinance, which prevents the laying of brick while the temperature is at freezing or below. This fact would probably bring the theoretical average possible days to even a lower figure.

Many interesting seasonal labor charts, showing the employment in various building trades, have been prepared. A study of these is very helpful in order to visualize the situation, but you can readily understand that most of these charts are theoretical as yet. A continued study of the subject and a comparison of additional charts from time to time, will no doubt help a great deal in working out improvements in the situation.

Mention should also be made of an article which appeared on the subject of this paper, published in the "Engineering News-Record" of January 11th, 1923, written by D. Knickerbacker Boyd who is President of the Philadelphia Building Congress. Mr. Boyd has been one of the prime movers in the study of this important question, and we had hoped to have him at this conference.

Cannot Evade Responsibility

The Construction Industry, and particularly engineers and contractors, cannot evade the responsibility of leadership, and they can secure this only through the co-operation of their various organizations.

To return more definitely to the question of lost time due to the seasonal effects, we have to admit that under present conditions construction is generally curtailed in the winter. The correction of this condition is a huge task and is perhaps the greatest problem facing our industry today, and one which would have a far reaching effect in reducing some of the present industrial waste. It has been pointed out that winter construction presents technical and economic problems. The technical problem of developing effective construction practices for cold weather has, to a considerable extent, been solved, but as yet no concerted effort has been made to solve the economic problem involved. The progress, however, that has already been made in winter construction is the best promise of its future possibilities, and many operations involving heavy excavation, municipal works, concrete and building construction have already been carried out successfully, both as to technical practices necessary for successful winter work, and as regards economy.

Standard Practices

Work on concrete structures of all kinds and building operations generally, are becoming more common in the winter season. Methods have been perfected to such an extent as to practically have become standard practice. These can be briefly stated as follows:—

1. All concreting and building masonry operations can be carried on in winter with dispatch and absolute safety by heating the material, housing in the work under construction and heating the enclosure.
2. Steel erection in winter is largely a function of storm and temperature. In any weather in which the workman can withstand the cold and work safely, structural steel can be erected.
3. Interior building work, plumbing, steamfitting, plastering, etc., can be performed in winter with little loss of efficiency.

From the economic standpoint waste in our industry is largely due to reduction of construction during cold weather. This can largely be overcome if the public could be brought to believe that winter construction offers real economies. These economies may be said to result from the following conditions:

1. Spreading overhead costs over twelve producing months instead of some less period.
2. Reducing the seasonal unemployment of men in construction and the allied industries.
3. Ironing out the peak in the curve of production of construction materials and equipment.
4. Equalizing the demand on transportation agencies.

As previously stated, it is not possible to carry out these changes unless the building public has placed before it clear evidence of specific savings, or at least no increase in cost as the result of winter work. This publicity must carry with it a full knowledge of the waste resulting from winter idleness in the construction industry, and the industry itself cannot be stabilized unless we, who are engaged in it, assume our share of the responsibility of placing the facts before the public.

Must Attack the Problem Seriously

It must be obvious to all of you that no real forward step can be taken in the direction of solving the seasonal employment question and other causes of lost time and unemployment in our industry without the expenditure of money, either on the part of the individual making the study, or on the part of the organization undertaking it. There is little use for us to discuss this question unless we are prepared to back it up with sufficient funds to work out the details. In other words, if we are to accomplish any real results in this important matter, as well as the matter of apprenticeship which will next be dealt with, we must first "Sell" ourselves the idea and then "Sell" it to our home organizations and others engaged in the industry. There is surely enough money in the industry to pay the price if once it is convinced that the investment will be profitable.

You will probably come to the conclusion that the two great questions which are being placed before you in this morning's session demand immediate action. If this is the case, a very strong conference committee should be formed at once, and a program worked out both as to organization, activity and an estimate of its cost.

If this conference of the Canadian Building & Construction Industries sees fit to appoint a committee for the consideration of ways and means leading to definite action along the lines indicated, it should consider the advisability of recommending to each important centre throughout Canada, the formation of a Building Congress for this purpose, and also a central Canadian Congress to co-ordinate the activities of the various localities.

Meeting of the Saskatchewan Branch Engineering Institute

On Wednesday, Jan. 24th, the Saskatchewan Branch of the Engineering Institute of Canada held a meeting at the Kitchener Hotel, Regina. The members met for a dinner at 6.15, following which Mr. J. A. Daly, Regina manager of the Northern Electric Company, read papers on "Scientific Methods of Commercial and Industrial Lighting" and "The Lighting of our Homes." The second paper was illustrated by lantern slides and both papers were heard with interest and profit. Mr. Daly demonstrated that no factory, office or store could afford to be without the best lighting systems and gave many practical ideas for scientific lighting. He also reviewed the development of the incandescent light and illustrated pleasing effects in home lighting.

An open discussion followed the papers when many points were discussed by the members. A vote of thanks was tendered Mr. Daly for his splendid papers. After the conclusion of the technical part of the meeting a whist drive was held, appropriate prizes being donated by Mr. J. N. DeStein.

Like Unto a Garden

(Continued from page 142)

no part in the activities of this Association,—whose interest, if any, is very passive. There are others whose interest is nil,—others who even question the advisability of carrying on this work.

They fail to realize that this great industry of ours is growing by leaps and bounds, both in magnitude, as well as in importance in the eyes of the community,—they fail to realize that if this Association does not at least keep pace with our industrial expansion, the individual contractors will soon be nothing more than the "chaff which the wind driveth away."

Rather let us hope that this Association of ours shall grow to be like that other tree mentioned in the opening chapter of the Psalms of David:

"And he shall be like a tree planted by the rivers of water, that bringeth forth his fruit in his season, his leaf also shall not wither, and whatsoever he doeth shall prosper."

In closing, just let me give you one thought to carry back with you to any "doubting Thomases" whom you may meet:

"Can you imagine a City,—a Province,—
a Dominion, without a garden?"

"The Present Apprenticeship System is an Absolute and Total Failure"

The Scarcity of Skilled Mechanics and the Unwillingness of Boys to Take up Trades Have Reached Such a Serious Stage that a New Policy is Demanded—A Plan that Gives Promise of Meeting the Requirements of the Situation

By J. M. PIGOTT
Of the Pigott-Healy Construction Co. Ltd., Hamilton, Ont.
At the A.C.B.C.I. Construction Conference, Quebec, P. Q.

There is no question of greater interest to building employers than the shortage of building mechanics. During the past year with the slight boom in the building business, we awoke to the fact that by a large percentage we did not have sufficient mechanics to properly carry out the building program of 1922. According to the figures published, contracts awarded in Canada for 1922 amount to about $325,000,000.00. At first glance this would appear to be an exceptionally large year, but further consideration will show you that it has been a very ordinary year. In the first place you must deduct from this total engineering products, totalling $120,000,000.00—residential construction, totalling $104,000,000.00—and when you have done this you will be surprised to find the total for business and industrial work of just $100,000,000.00 as compared with $102,000,000.00 in the year before, that is 1921, and $147,000,000.00 in 1920. I am deducting these two classes of work because in the case of engineering projects the number of building mechanics employed is comparatively small, and in the case of the residential work it is really outside of our business, and represents to a large extent the work of men other than building mechanics.

So that we find that as compared with 1921 and 1920, 1922 is an ordinary year, yet we found everywhere that our volume of business, or the quantity of work we were handling was governed to a large extent by the number of mechanics we could get to do the work,—and in almost every locality with the possible exception of the West—certainly all throughout the United States and middle and Eastern Canada—almost double the number of mechanics could have and should have been used.

If this is the case in a year like 1922, what will you have to face when the building program of this country is back to the swing of 1911, 1912, 1913 and 1914? According to the contracts awarded in Canada, if the proper allowance is made in the value of the buildings—that is to say—if consideration is given to the fact that materials have advanced 80% and labor almost as much, you will see that in the years mentioned before the war started, we were doing double the work that we did during the last year.

Think seriously, gentlemen, of what your situation actually is in regard to the building mechanics available in 1923.

It is not exaggeration to say that in spite of all the rosy forecasts for the year 1923, the work which will be done in 1923 depends—not on the willingness of capital to invest—not on our capacity to plan and construct—but absolutely on what the diminishing number of skilled mechanics in this country can actually do.

Capital may be available everywhere, our plants and organizations capable of almost unlimited work—materials manufactured in anticipation and railroads anxious to have them, unskilled labor willing to work and looking for it—but the skilled building mechanic controls the engine of business—and it will have to be valved down—rationed out as it were—to what he can absorb—to what he and his fellows can do—and no more.

In order to talk intelligently as to the best method of improving this condition we must go very fully into the probable causes of it. We can take, however, one short cut in this respect, that if we can show that the number of mechanics is not increasing, but on the contrary decreasing, and if we can show that it is not a matter of the volume of business having outstripped the supply of mechanics, then we know at least that the whole fault lies in the fact that we have failed to train mechanics to supply the demand. This brings us very quickly to the apprenticeship question and the fact that we are in our present difficulty due to the failure of our apprenticeship system, both now and back a great many years.

As to the number of mechanics decreasing, it is very hard to get any reliable data in Canada to support statements in this connection. We have ascertained from the Dominion Bureau of Statistics that in the year 1911 we had a total of 245,990 men in the building trades, which they sub-divide into the different classifications, among which, for instance, we see that we have 60,203 carpenters, 18,660 bricklayers, stone masons and stone cutters, 19,865 painters, 5,815 plasterers, 11,244 plumbers. There are no statistics of this kind available since that time. If we turn to the same Department, however, in the United States we find that in 1910 they had 169,402 brick and stone masons, 273,441 painters, 47,682 plasterers, 14,078 roofers and slaters. The figures for 1920 in these same trades showed in the case of brick and stone masons 131,264—a decrease of 23.6 per cent; painters in 1920 248,479—a decrease of 9.5 per cent; plasterers in 1920 38,255—a decrease of 19.8 per cent; roofers and slaters in 1920 11,378—a decrease of 19.2 per cent. These of course, are only some of the trades in each case.

In the absence of any figures for 1920 in Canada, I believe it is reasonable to assume that we have in the case of certain trades at least, fewer mechanics year after year, in particular bricklayers and plasterers, and in the case of many other trades such as carpenters, while there may not be an actual shrinkage in the available number, there is just as serious a condition in the matter of their skill and efficiency. There are very few properly trained carpenters today, and they are getting fewer each year.

Then, as to the volume of business outstripping the supply, I think we have already shown in the first paragraph of this paper that business is far behind what it was either in yearly totals or monthly averages, during the years 1911, 1912, 1913 and 1914.

It is then, entirely a matter of failure of the Apprenticeship System.

It is a difficult thing to decide what percentage of new mechanics should be provided each year to make up the wastage and increased demand. Paul Douglas says unless one apprentice is trained for every four mechanics that a trade loses its vitality and a scarcity takes place.

The Unions themselves in their regulations as to apprentices have about one to eight or ten. When apprenticeship was functioning properly it would appear that the ratio,—for instance, in the carpentering and bricklaying trades—was as one to five. This is a very important side to the question of the scarcity of mechanics because we must be careful not to produce an oversupply to the extent that the seasonal unemployment has too serious an effect. For our purpose it would appear to me that we would be setting a mark pretty high and doing very well in fact in the next few years if we achieved a ratio of one to ten in the cities.

A careful survey of the work that is being done now with apprentices clear across the country indicates only too clearly just how stagnant the training of apprentices is and just how serious the situation is. The following cities have turned in reports: London, Sarnia, Ottawa, Woodstock, Peterboro, Niagara Falls, Winnipeg, Sherbrooke, Toronto, Calgary, Brantford, North Bay, Halifax, Galt, Montreal, Moose Jaw, Saskatoon, Hamilton, Windsor and Quebec. Without going into too much detail, a summary of apprentices in training reported by these places shows—Masons 59, Carpenters 50, Heating and Plumbing 62, Plasterers 23, Sheet Metal 32, Electrical 42, Painting 12, Stone Cutting 5.

If we had in training 10% of the number of mechanics in these various trades, a simple calculation will show that thousands of these apprentices should be at work. For instance, in the bricklaying, masons and stone cutting trades, according to the 1911 figures, it would require approximately 360 mechanics to replace even the death rate, and the death rate, according to insurance statistics, is only approximately 2 per cent. Think then of how ridiculous the figures appear of what is actually being done. I will not draw any figures from the report of our Dominion Bureau statictics as to the number of mechanics in the different trades engaged in this country in 1911, because there are several striking discrepancies in these figures which to my mind show that they are not reliable. The only figures available which are any guide at all will be found in the publication "Labor Organization in Canada," issued by the Department of Labor for the year 1921, which states, "It is estimated that the number of Trades Unionists belonging to the United Brotherhood of Carpenters and Jointers affiliated to the Ontario Provincial Council is 7,800. The number of Bricklayers, Masons and Plasterers who are Trades Unionists is estimated at 2,400." If we reach the one to ten ratio in Ontario alone you can readily see that it would mean 1,000 apprentices in Ontario for these few trades alone, and yet **for the whole of Canada** in these same trades we have approximately 140 boys in training.

Let me quote a few extracts from the reports of the different cities:

London, Ont.: "The apprenticeship system in this city is practically out of vogue."

Sarnia, Ont.: "The only apprentice is a young man eighteen years of age whose father is a bricklayer. When the father is employed the boy goes with him."

Woodstock: "To my knowledge there has not been an apprentice in Woodstock in the last five years."

Peterboro: "It is about 12 years since the last bricklayer and plasterer learned his trade in this city."

Niagara Falls: "The only apprentice I am aware of in Niagara Falls is one bricklayer apprentice."

Sherbrooke, Que.: "There are no apprentices in any of the trades in our city at the present time."

It is not necessary to state that contractors have been fully alive to the urgency of apprenticeship training for the past four or five years. There has scarcely been a convention of any kind during that time where that problem has not been dealt with and efforts made to find a solution. Annually committees have been appointed and reports brought in. Standing committees have endeavored to find the way out. At the Industrial Conference held in Ottawa two years ago some of the best men in the industry worked on this question for four or five days and submitted a report which has been published by the Labor Bureau and has been in circulation from time to time ever since.

The outstanding fact, however, is that with a full knowledge of the urgency, in spite of high wages being paid to the mechanics, the apprenticeship system is in no better condition today,—in fact, it must be clear to you that as a means of adding to the numbers of our building mechanics the **present apprenticeship system is an absolute and total failure.**

Technical Schools Doing Nothing

Promising apprentices are not available. For many years the percentage of young men entering high school has been increasing. It has been found and is stated by Dr. Merchant, the Director of Industrial Education for Ontario, that generally speaking, the boys entering high school today are lost to us, as, by the time they have completed their high school education they are headed towards the professions. Since the putting into force of the Adolescent Act and the institution of Technical Schools a sorting out has been attempted, and when scholars reach the age of fourteen or thereabouts an effort is made to interest them in industrial work and a separation takes place,—by far the greater majority going to high school and the balance going to technical school. During the two years that they attended the technical school they are taught subjects which are intended to assist them to choose their vocation when they are sixteen. It is found that of the percentage who choose the technical course and about two years later decide as to their future training, the number who choose such trades as bricklaying, stone mason work, plastering and carpentering is practically nil. A small percentage choose some of the inside building trades. So far as Ontario is concerned, the technical schools, generally speaking, are doing nothing in the matter of training building trade mechanics.

You will understand, of course, that in speaking of technical schools I am naturally speaking of Ontario only. It must not be supposed that this is intended as a criticism of the technical schools. They are no more to be blamed for failing to interest these young men than we are. After all is said and done, the technical schools are conducted to meet the demands of the locality in which they are built, and if their woodworking machinery stands idle, if no classes exist in the bricklaying, plastering or any of the trades of that class, it merely goes to support the statement that building trade apprenticeship does not appeal to the young man or his parents.

Why is this?

Of your own experience you know that apprentices taken on in the spring or summer can be carried through on the work in which they are interested to about the 1st of December. About this time, or shortly after, these boys are either laid off and are thrown back on the hands of their parents to be supported for about 5 months, in which case they generally go into other work, and the employer's money and the boy's time has been wasted, or they are kept on at odd jobs of a laboring nature at the contractor's expense until the spring. This condition is due entirely to the seasonal nature of the building business. It is no wonder that parents endeavouring to have their boys trained in the building trades become discouraged and that others are prevented by what they see from making the attempt. On the other hand, the employer who has trained apprentices during the past few years has seen his work and the investment he has made in the apprentice either lost through the apprentice going into other work, or if he has kept him on, has seen him at the completion of his apprenticeship period striking out for the first employer who will pay the highest wages. Because of this feature, it is difficult to interest employers in the taking on of apprentices. They feel—and feel rightly—that the training of mechanics is as much their competitors' business as it is theirs.

This is the whole trouble of the apprenticeship system today. It is wrong in principle. The training of building mechanics is a matter for the trade at large, to be paid for by the trade at large. On the other hand, the apprentice has got to be sure of steady employment at the trade he has chosen and at steady pay. If we can bring these two conditions about I am satisfied that apprenticeship in the building trades will be sufficiently attractive to provide us with a proper supply of young men.

We are given plenty of instances of trade schools being established,—particularly in the United States. I have examined many reports on these trade schools such as exist in Cleveland, Chicago and San Francisco, and I am convinced that while they may do some good, their efforts will barely scratch the surface and the output of such institutions will have little effect on the shortage. In addition to this, they are the result pretty largely of labor difficulties with Trade Unions and are very temporary in character.

Dr. Merchant, Director of Technical Schools in Ontario, who has made a keen study of the training of youths in industry had this to say in a recent report which he delivered on the subject: "But in this respect schools have their limitations. I have observed with a great deal of interest during the last ten years the development of our own schools, and I have had the opportunity of studying at close range, the operation of the most important trade schools in Europe, and I am convinced that a school cannot alone equip fully a youth as a journeyman in any trade. I am convinced also that some form of apprenticeship should be restored in which the school and the shop or the job both take a part in the training of apprentices."

We also have seen in the State of New York and in the State of Wisconsin definite plans for apprenticeship introduced. In the State of New York, following the Lockwood investigation, the Building Congress took place and out of this developed a comprehensive apprenticeship program. I have the indenture papers and the courses laid out by educational experts for the training of these boys. I personally investigated the working of this plan. I have with me a particularly fine indenture agreement and vocational course as laid down by these experts for carpentry apprentices, which has been worked out at great expense and much effort on the part of enthusiastic employers and their friends assisted by the Trades Unions, and I can state authoritively that not one single boy is taking this course. In Wisconsin they have enacted legislation which you will see quoted and held up as a model arrangement. As a matter of fact, an investigation will show that in spite of the most energetic efforts on the part of this organization in the whole State of Wisconsin in July 1922 exactly 172 apprentices in all of the building trades combined were in training.

What then is wanted? It is quite evident that apprenticeship must be a combination of work at the trade under actual building conditions and technical training, with a certain amount of general education in technical schools or some such similar institutions. We can employ apprentices on the building operations for seven months; for the other five months these boys should receive their technical training and general education in the school. For instance, take a class of 50 boys; start them in at a technical school on the 1st of December; turn them out on the 1st of May to be farmed out on the different construction jobs and kept at work under actual building conditions until the 1st of December, then back to the technical school on the 1st of December until the 1st of May. A proper supervision of this apprenticeship during the outside period would give a sufficient variety of work and working conditions to push the boy along in his training to the best advantage.

The system necessarily can only be adopted in centers large enough to absorb at least a proper class of these boys in the different trades. Careful attention will be necessary on the part of the educational authorities and the Trades Unions and the employer through a small local board to keep the boys in training at the different trades in the proper proportion to the mechanics.

To my mind the most satisfactory way of conducting this work would be by a blanket agreement between the Trades Unions through their Building Trades Council and the Builders' Association with the Technical School as sponsors for the boys as the third parties.

The second part of the system would be the payment of these boys in these trades of $500.00 a year. That this money be derived from the employers by special assessment by exactly the same means as the Workmen's Compensation funds are collected in Ontario, that is, a percentage on the pay-roll. This may sound somewhat radical, but I believe it is entirely practical.

It is not many years ago in Ontario when we carried our own workmen's compensation. We either carried the risk ourselves or we went to an insurance company. Many accidents occurred where the loss was so great as to put the employer out of business, yet it was not his fault. In many instances the injured workmen lost their compensation or got but a small portion of it, yet this was not their fault. Injuries to workmen and compensation itself was one of those things which grew out of the nature of the business. In spite of all precautions, accidents would occur. The Ontario Government rightly decided that here was something that in justice to all should be borne by the trade at large. The Workmen's Compensation Board of Ontario is an accomplished fact, and there is no finer institution in the business today. We are getting good administration; we are free of the risk; the men are sure of proper compensation from the trade as a whole, and the public pays for it.

Is the shortage of building mechanics not just as vitally a matter for the trade at large? Is it not in the public interest? Is it not something for which the public should pay, just as they do now in connection with Workmen's Compensation?

The figures for the Workmen's Compensation for the year 1922 are not yet published. The figures for 1921 for Ontario for Class 24, which is our class, which covers brickwork and stone masonry, lathing, and plastering, carpentry, electric wiring, plumbing and heating, painting, sheet metal work and general construction, show that on an assessment of 2% on pay-rolls totalling $18,750,000.00 the sum of $375,000.00 was collected that year. If this rate were 3%, $186,000.00 more would be collected. The addition of 30c. to the rate of 1921 on the pay-rolls of that time would produce $56,000.00. The rate last year for this class was $1.80. A 30c. increase would give a rate of only $2.10, yet it would produce $56,000.00. The important point to be borne in mind is that the 2% of 1921 or the $1.80 of 1922 was figured in the cost estimates of our tenders just as carefully and surely as the lumber, brick and cement. $150,000.00 in the Province of Ontario would place in training 300 boys; 150 of these boys might be considered as being added to the ranks of the mechanics each year. I do not mean by this that the period of apprenticeship might be cut down to two years. The period of apprenticeship is a matter to be arranged between the Trades Unions and ourselves, but no matter what that arrangement is, I am satisfied that with the intensive training that the boys will receive that they will be of great help in their second year.

The proposal, however, is that for the time being, and in order to introduce and perfect this system, that the Provincial and Dominion Governments be asked to bear the burden of this with the employers equally. If this was done, the 30c. increase to the rate of the Province of Ontario Workmen's Compensation would not be felt by the employer and it would raise their quota. Ultimately the trade should stand the expense,—every trade controlling the number of apprentices and being called upon to pay only its proper share.

When it is borne in mind that the Compensation rates in Ontario are less than one-half the rates of any of the States across the line that I am aware of it will be readily seen that we have plenty of money to take care of this problem of ours without inflicting a burden upon the industry.

So far I have dealt with this problem pretty much as I see it in relation to the Province of Ontario. I see no reason, however, why the same methods should not be applied to the other Provinces,—in fact, it is most desirable that what one Province does the others should do in like manner.

We have been confronted each winter for the past few years with the problem of the unskilled unemployed, and we have seen many hundreds of thousands of dollars expended in practically every Canadian city, in relief. A large part of this unemployment is due in the first place to the shortage of building mechanics or skilled men during the open building months when many more unskilled men might have been employed had we had mechanics. Apart altogether from this, a large percentage of these unemployed are unemployed because they have no trade, for have we not met on the one hand an oversupply of unskilled men at too low a wage to maintain them through the winter and on the other hand a shortage of men at too high a rate in comparison?

Except as an emergency program, the importing of skilled mechanics from other countries is not sound economy; what we should have in this country is the training of our own boys.

Immediate steps should be taken in my opinion to secure the co-operation of the Trades Unions, for I believe the time has come in our industry when there are many things of this nature in which our interests are more or less identical, where we should work in closer harmony for the benefit of all. In the matter of apprenticeship I am sure we will obtain help and co-operation of real benefit from organized labor.

If this plan in your opinion offers a solution to the apprenticeship problem, no time should be lost in securing the necessary machinery for its operation. How this is to be brought about circumstances will have to dictate, but this Convention should not adjourn before a definite program is laid down with instructions as to how it is to be followed out either for this plan or such an amended one as may be decided upon.

Meeting of the Canadian Section of the American Water Works Association

The Canadian Section of the American Water Works Association will hold a mid-winter meeting in Toronto, on Thursday and Friday, February 22nd and 23rd, at the Carls-Rite Hotel. The programme of proceedings follows:—

Headquarters—Carls-Rite Hotel

Thursday—February 22nd, 1923.

9.30 a.m.	Registration of Members.
10.30 a.m.	Meeting of Executive Committee.
11.00 a.m.	Open Session.
	Reports of Special Committee.
	(a) Hose Connection on Fire Hydrants.
	(b) Connections for Auxiliary Fire Protection.
	(c) Section Finances.
12.30 p.m.	Luncheon.
2.00 p.m.	Address of Welcome.
2.30 p.m.	Water Works Intakes by Professor R. W. Angus, University of Toronto.
	Preparation of Water for Filtration by A. V. DeLaporte and F. A. Dallyn.

Friday—February 23rd, 1923.

9.30 a.m.	Waterworks Records and Accounting—Mr. Henderson, The Peterboro Utilities Commission.
	Chlorination Apparatus and Its Control—G. A. H. Burn and A. E. Berry.
12.30 p.m.	Luncheon.
2.30 p.m.	Special Water Works Tools and Equipment—Alexander Milne, St. Catharines.
3.45 p.m.	Application and Operation of Gasoline Auxiliary Pumps—S. L. Fear, M. E.

How Water Power Development in Canada Compares with Other Industries

The National Importance of Our Hydraulic Resources—The Dependence of Canada on Water Power—More Money Invested than in Any Other Manufacturing Industry

By J. B. CHALLIES
Superintendent, Water Power Branch, Dept. of the Interior, Ottawa

The development and distribution of water power has grown in a comparatively short period to the dimensions of a national industry and it has become a matter of considerable interest to discover the position that it occupies in relation to other industries of national importance. To this end the Dominion Water Power Branch of the Department of the Interior has studied the water power industry and outlined its position from the following points of view:—

1. As a source of power. 2. As a leading industry. 3. As affecting the fuel situation. 4. Water power and manufacturing compared to agriculture. 5. Electrical industries directly dependent on water power.

1. As a Source of Power

Canada occupies an exceptional position in her absolute dependence on water power for national prosperity and progress—very different for instance to that of the United States.

The United States has vast coal resources available in the heart of her manufacturing district and the recent Superpower Survey carried out by the Federal Government shows that coal must remain the chief source of power since not more than 21% of the power requirements of that district can ever be met by water power.

On the other hand, Ontario and Quebec, containing the corresponding portions of Canada, have no coal but have abundant water power.

The census of central electric stations in Canada, 1920, shows that water power constitutes 92% of all such power installed in the Dominion and furnishes 97% of all the energy generated, this being widely distributed for manufacturing and street railway purposes as well as light; in addition to this there are many manufacturing plants from coast to coast entirely dependent on water power.

The absolute dependence of Canada on water power for her national life is shown by the fact that the hydraulic horse power installed in Canada per 1,000 of the population is 337 in Canada to about 95 in the United States, or more than 3½ times as much. This shows indisputably that Canada has made far more use of water power than has the United States and that in her water power she posseses an advantage that should be utilized to the utmost.

2. As a Leading Industry

Capital invested—The census of the central station industry, 1920, shows that the average capital invested in hydraulic developments including transmission and distribution was $239 per h.p. installed—this covers central stations only.

For industrial water power developments the Dominion Water Power Branch has deduced from the best data available an average figure of $127 per h.p. installed.

Applying these figures to the respective total horse power of central station and industrial hydraulic plants, gives an average figure of $209 per h.p. installed.

The total h.p. now installed is 2,969,659, so that the total capital invested in water power development is $620,659,000.

Annual revenue—The revenue shown by the 1920 census from 1,754,130 hydraulic h.p. in central stations was $56,931,000 or $32.50 per h.p. installed (not per h.p. year). In addition there was 705,070 h.p. installed in private industrial plants, the sum of the two making up the 2,459,200 h.p. installed in 1920; the annual value of this may be very conservatively estimated at $15 per h.p. or $10,576,050 per annum. The total annual value was therefore over $67,507 000 in 1920 and the pro-rata for the present installed h.p. will be $81,600,000.

This, however, by no means represents its real national value. Concerning that see under "The Effect on the Fuel Situation."

Position as a national industry—The position taken by water power in the national industries of Canada is not realized for the reason that this item has never been given separately in the figures issued by the Bureau of Statistics.

The figures for the central station industry are given by the Bureau of Statistics but these include steam power (about 8%) and do not include the large amount of private industrial water power development (28.7% of the total).

The figures for water power alone have been given above with the basis on which they are arrived at.

For the purpose of comparison the said figures for water power are therefore shown in the following two tables with the preliminary figures of the Bureau of Statistics for other industries.

Basic Canadian Industries, 1921

	Capital Invested	Production
1. Farm values	$3,884,255,000	$1,033,432,000
2. Live stock	1,550,544,000	362,801,000
3. Minerals	735,546,000	172,327,600
4. Water power	620,659,000	81,600,000
5. Forest products	464,454,000	453,381,000
6. Fisheries	50,405,000	35,441,000
7. Furs[2]		10,151,000

It will be seen that in this table[1] water power stands 4th in order of capital invested. 5th in value of product. The value of product given is not, however, the full measure of national value, which should be studied under the head of "Effect on the Fuel Situation."

Leading Manufacturing Industries

	Capital Invested	Value of Product
1. Water power[4]	$620,659,000	$ 81,600,000
2. Pulp and paper	275,767,364	139,986,457
3. Log products	231,203,247	222,652,070
4. Foundry and machine shops	100,606,542	81,710,215
5. Slaughtering and meat packing	[illegible]	[illegible]
6. Rolling mills and		

steel furnaces	88,106,635	89,229,144
7. Agricultural implements	84,331,715	37,715,331
8. Flour & grist mills	76,411,423	262,786,759

It will be seen from this table[3] that there is more capital invested in water power development than in any other manufacturing industry.

(1) Compiled from table of the "Wealth of Canada" issued by the Bureau of Statistics. Not including undeveloped resources.
(2) Other than fur farming which is included in farm values.
(3) From "The Forty Leading Industries," Bureau of Statistics, 1919, except water power, which is not there given and is for 1922.
(4) This is a basic necessity to nearly all industries and would perhaps be more correctly described as "raw material."

3. The Effect of the Fuel Situation

The real national value of water power is not properly represented by its selling price, a total of $81,600,000 as shown above. Water power in general and particularly in Canada due to favorable conditions, is a cheap power to produce and is therefore sold at low rates compared to fuel power, to the great benefit of industries and municipalities.

The real measure of its value is the sum that would represent the same amount of power produced from fuel if the water power had not been developed.

The now generally accepted figure for the coal equivalent of water power is ten tons per h.p. year. Taking 9 tons per installed h.p. and our present total of 2,969,659 installed h.p. the coal equivalent is 26,726, 930 tons per annum or at an average price of $10 per ton for imported fuel, $267,270,000 per annum.

Assuming for the moment that Canada could have reached her present development without water power nearby, the whole of this would represent additional annual expenditure for imported coal—furthermore the power so produced would have cost from two to three times as much as water power and would have been a heavy if not fatal handicap to the development of our manufacturing industries in competition with those of the United States.

Compared with such a handicap as this the annual deficit on the National Railways is small and it is very clear that Canada could not have attained her present development without water power. In view of the fuel situation water power is the very life blood of Canada and its further development is essential to industrial progress.

4. Comparison of Farming and Manufacturing Industries

It is not perhaps generally realized how near Canada is to the time when her manufacturing interests will equal or exceed her agricultural interests and therefore how vital to her uniform progress is the development of water power.

The following table shows the position in 1919 as the figures for that year are the latest complete figures available for manufacturing industries.

	Manufactures 1919	Farm & Live Stock 1919
Capital invested	$3,230,686,368	$5,665,503,000[6]
Persons employed	681,500	953,335[5]
Value of uroduct	3,520,724,039[4]	1,969,648,000[6]

(4) It will be seen that the value of manufactured products largely exceeds that of agriculture, but the former includes some duplication and includes the manufacture of butter and cheese, meat packing, milling, etc.
(5) Estimated. Canada Year Book, 1920, p. 523 shows 933,735 persons engaged in agriculture in 1911. Census of 1921 shows rural population to have increased by only 2.1%, so same percentage has been added to persons engaged in agriculture.
(6) The figures for 1921 have fallen to $5,436 and $1,396 millions, respectively.

5. The Electrical Industry

Industries Directly Dependent on Water Power

The foregoing figures for the water power industry represent only the capital invested in and value of product from actual water power developments.

There are, however, other large industries that are directly related to and almost wholly dependent on hydro-electric development for their existence, i.e., electric street and inter-urban railways and the electric manufacturing industry.

Since water power supplies 97% of all the central station output and the vast majority of all the private industrial power it is the overwhelming factor in all power and street railway supply and it constitutes, directly or indirectly, at least 90% of the support and market for the Electric Manufacturing Industry.

It seems therefore that this memorandum would be incomplete without summarizing the above three great industries under the head of the "Electrical Industry." The latest available census figure is taken for the central station industry as a whole; "other water power" represents that added since that date to October 1922, and the figures of the Bureau of Statistics are taken for electric railways and manufacturing.

	Capital invested	Value of product or gross receipts
Central stations, 1920	$448,273,600	$66,067,300
Other water power, 1922	200,392,000	25,420,000
Electric railways, 1920	199,000,000	47,000,000
Electric manufacturing and supply, 1919	45,956,400	34,187,600
Present totals exceed	$893,622,000	$172,674,900

Capital and receipts estimated on basis of 1920.

The above table gives the latest figures available but some are as far back as 1919, so that the present totals are probably far in excess of those shown.

It will thus be seen that the capital invested in the "Electrical Industry" and directly dependent on water power for its existence will by now amount to over $900,000,000.

It should, however, be emphasized that not only the electrical industry but also the vast majority of all the manufacturing industry of the Dominion is already wholly dependent on water power and this will be even more the case in the future. On account of the steady rise in the cost of coal many plants using steam will make increased efforts to obtain water power and it may be noted that many industrial concerns needing steam in the manufacturing process are now using off-peak surplus water power for steam production. The Chicago Tribune's paper mill at Thorold, Ont., has been equipped with 5,000 h.p., of electrically heated steam boilers and the mills of the Laurentide Paper Company, the Belgo-Canadian Paper Company and the International Paper Company on the St. Maurice river have been equipped with similar electrically heated steam boilers.

Summary

As a source of power. The U.S. has vast coal resources in the heart of her manufacturing districts—Canada has none in the corresponding district (Ontario and Quebec) but has abundant water power. Illustrating our dependence on water power, that installed per 1,000 of the population in Canada is 337 h.p. to about 95 in the U.S., or 3½ times as much.

As a leading industry. The water power now developed totals practically 3,000,000 h.p., the capital invested therein over $620,000,000 and the annual gross receipts over $81,000,000.

Among the basic Canadian industries, including agriculture, minerals, forest products, etc, water power stands fourth in capital invested.

In manufacturing industries, water power exceeds any other in capital invested and exceeds the next highest (pulp and paper) by over 100%.

Effect on the fuel situation. The coal equivalent of our developed water power at $10 per ton for imported coal, is $267,270,000 per annum, This is approximately the sum that would have to be sent abroad annually if our water power had not been developed and furthermore the power so developed would cost the user two to three times as much per horse power. This would form a heavy if not fatal handicap to the development of our manufacturing industries.

Manufacturing and farming. Manufacturing in Canada is practically wholly dependent on water power and the day is not far distant when manufacturing will equal if not exceed farming in national importance. The annual value of manufactured products already greatly exceeds that of farm products.

Industries directly dependent on water power. The vast majority of all power for manufacturing and 97% of all central station light and power in the Dominion is supplied by water power.

Street railways are also almost wholly dependent on hydro-electric power and the electric manufacturing business is dependent on water power for well over 90% of its receipts.

All these industries may therefore be grouped together as specially dependent on water power, under the term of "The Electrical Industry," and it will be seen that the capital so invested will by now amount to over $900,000,000 and the annual value of product or gross receipts to approximately $200,000,000.

. The growth of water power. The increase in developed water power from 1912 to 1922 (Nov. 1) has been 105%

The use of water power is distributed thus:—

In central stations h.p.	2.164.870	73.0%
In pulp & paper mills h.p.	484,228	16.2%
In other industries h.p.	320,561	10.8%
	2,969,659	100.0%

New Power Development at Chicoutimi

Preliminary Details of a Plant to be Built on the Chicoutimi River for Price Bros.—Nature of the Site and Factors Entering into the Design of the Development

A new power development is under way at Chicoutimi. This is a town of about 10,000 inhabitants situated at the junction of the Chicoutimi River with the Saguenay River. It is in the county of Chicoutimi, and is the present terminus of an important branch of the Canadian National Railway running north from Quebec City. This branch line runs due north for 175 miles to Lake St. John where it branches again running west along Lake St. John and east down the Saguenay River for about 50 miles to Chicoutimi.

Concrete work has been started on this plant about two weeks and it is hoped the main dam and retaining walls will be completed before the spring floods.

For some years past this town has been intimately identified with the pulp and paper industry of Canada. The population of the town is almost entirely dependent on this one industry for its livelihood. It is the final stopping place for a great quantity of the pulpwood which is cut in territory north of the Saguenay River and east of the Shipshaw River. This latter river joins the Saguenay River a few miles above the town of Chicoutimi. There is also a large quantity of pulpwood coming to the mills here from the opposite side of the Saguenay River, in the territory drained by the Chicoutimi River itself.

More recently two other towns have come into prominence through the same agency thus detracting to some extent from Chicoutimi's importance. These two towns are Kenogami and Jonquiere where the big Price Bros. mills are located.

The Chicoutimi River joins the Saguenay River about 65 miles from the junction of the Saguenay River with the St. Lawrence. It is comparatively short (about 10 miles long) and runs in a northeasterly direction. It is one of two streams which drain the waters of the big Kenogami Lake, the other one being the Ausable River, which also drains into the Saguenay. The Ausable runs out of the centre of Lake Kenogami and the Chicoutimi out of the east end.

Watershed

The watershed in connection with this development is about 1,450 square miles in extent, draining almost entirely into Lake Kenogami which is a long narrow lake. Numerous streams emptying into this lake reach out into all the surrounding territory. These streams are numerous though not very big or very long.

The precipitation over this area is probably in the neighborhood of 30" per annum, and the run-off is about 50% of this figure. The country is almost completely wooded, being thinly settled, except in the vicinity of the Saguenay River.

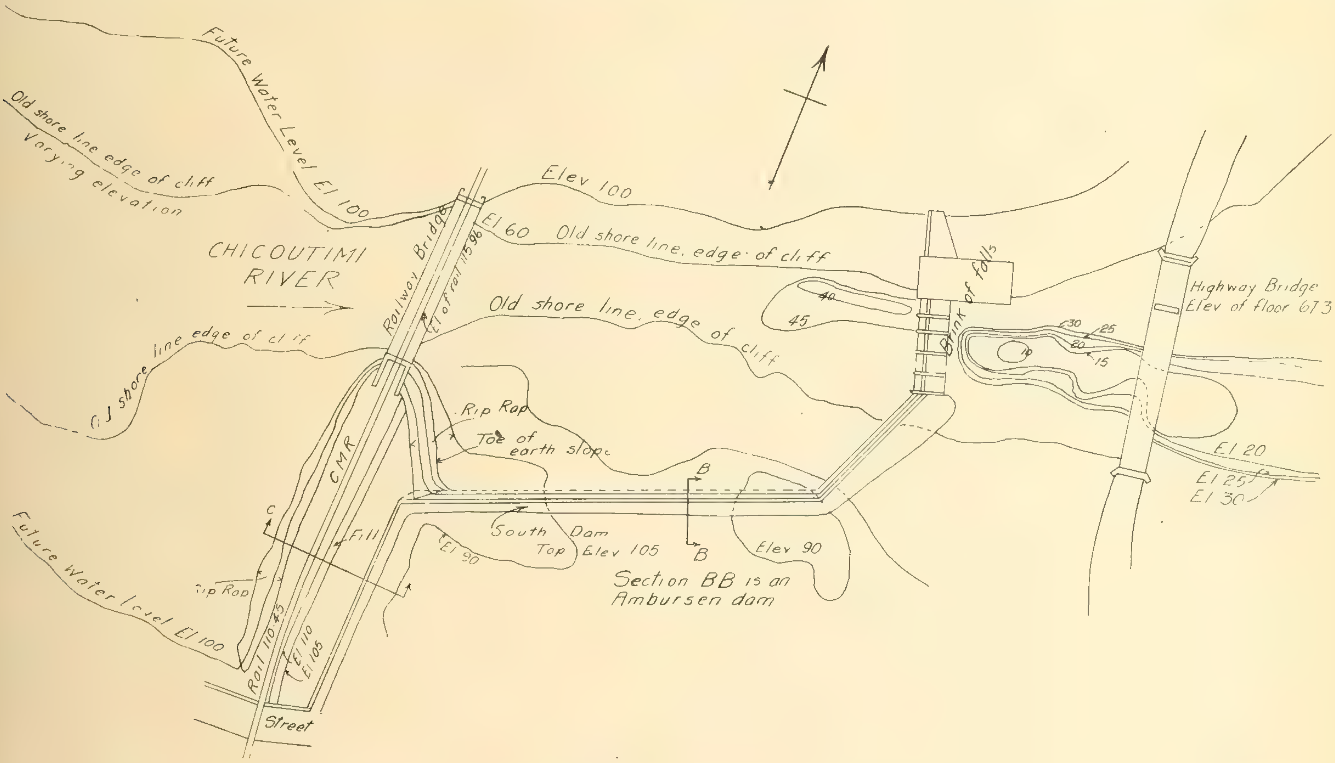
Flow of Water

For some years past the Price Bros. interests have owned the water power rights on the Chicoutimi River at the site being developed and have been using a small percentage of the available power. They also own the rights to the power on the Ausable River which runs through Jonquiere and Kenogami on its course to the Saguenay. The flow in these two rivers has been to some extent regulated, for some years, by small old fashioned wooden dams at the exits from Lake Kenogami. For this reason it is not possible to say what the minimum or average low flow would be under natural conditions. At the present moment the flow in the river is only 225 cfs. and is expected to go as low as 175 cfs. before the spring flood commences.

The average flood flow is estimated by the Quebec Streams Commission to be about 18,000 cfs. in the Chicoutimi River only. The flow under the conditions of partial regulation as noted above is 450 cfs. in the Chicoutimi River and 250 cfs. in the Ausable River. The Quebec Streams Commission has been authorized by the Provincial Legislature to commence at once the development of the storage capacity of Lake Kenogami by the construction of dams at the entrances of the two streams running out of the Lake. In this way it is expected that minimum flow of 1,200 cfs. will be diverted into the Chicoutimi River, and 600 cfs. will also be diverted down the Ausable River for any purposes which may eventually arise. Several dykes will also be built in suitable places to allow the water to escape when the level of the lake is raised by the main dams. A complete description of the new storage work to be undertaken by the Quebec Streams Commission at Lake Kenogami will appear in a future issue of the "Contract Record." It is sufficient to say here that they expect to maintain a constant flow of 1,800 cfs. out of Lake Kenogami with the use of regulating dams.

Location of the New Development

The river runs through the town thus dividing it into two sections which are connected by a traffic bridge and also by a railway bridge. The direction of flow of the river at this point is almost due east. The two bridges mentioned above are about 650 ft. apart and the site of the dam and power house is between the two and slightly nearer the traffic bridge which is down-stream from the dam. The dam site is 600 feet from the nearer bank of the Saguenay River and was formerly occupied by a timber crib dam which was destroyed during the construction of the new structure.


Future Water Level El 100
Old shore line edge of cliff
Varying elevation
Elev 100
El 60
Old shore line, edge of cliff
CHICOUTIMI RIVER
Railway Bridge
El of rail 115.96
Old shore line, edge of cliff
Old shore line edge of cliff
Rip Rap
Toe of earth slope
B
CMR
C
Fill
South Dam Top Elev 105
El 90
B
Elev 90
Section BB is an Ambursen dam
Rip Rap
Future Water Level El 100
Rail 110.45
El 110
El 105
Street
40
45
Brink of falls
30
25
20
15
10
Highway Bridge Elev of floor 67.3
El 20
El 25
El 30

Plan of the power development to be carried out on the Chicoutimi river

Topography

The natural channel of the river is bounded on both sides by precipitous banks of varying height, in most cases the banks being solid rock. On the left or north side of the river the ground slopes up at a comparatively steep incline from the edge of the precipitous bank of the river and continues up for some considerable height before breaking. This condition continues for some distance up stream from the site, the top of the slope remaining at a fairly constant elevation but varying considerably in its distance away from the water's edge. The future elevation of the water will never threaten to reach the top of the bank as there is a difference in the elevation of about 18 feet between the top of the bank and future water level.

On the opposite side in the neighborhood of the site the conditions are not the same though the bank becomes much steeper above the railroad bridge and more nearly approaches the contour above described The precipitous bank at the water's edge is not nearly so high and the ground behind it slopes away much more gradually and does not at any point reach the elevation of the north bank.

The north bank presents a first class natural barrier against the raising of the water whereas the south bank must be supplemented by embankment walls below the railway bridge.

It should be noted at this point in the description that the tide affects the level of the water in the Chicoutimi River up to the base of the falls and is stated to be a maximum of 20 feet between low tide and high. There is a natural fall, just below the dam, of 35 feet which is being taken advantage of in the design and location of the power house. The fact must necessarily have an intimate bearing on the maximum and minimum head available as the water level in the tail race will vary considerably in the space of one day. As a matter of fact the tide varies from elevation 19.5 to elevation 39.5 during the day so that the available head is hardly ever constant.

Type of Construction

As to the type of construction, there is a bulkhead section consisting of a solid gravity wall connecting the power house to the north bank. This section runs up to elevation 105.00. On the south side of the power house there are five sections of spillway of which the crest elevation is 87.5 and this spillway section supports 6 piers at 18 ft. centers which are carried up above this elevation to support the Tainter gates. The elevation of the tops of the gates is 100.00, which will be the future water level above the dam. A short section of solid bulkhead type will connect the south end of the spillway section to a long wing wall of the Ambursen type which continues upstream to the railway embankment. The top of this wing wall will also be at elevation 105.00. At the upstream end of this wing wall there will be a shorter section of gravity wall running along the railway embankment on the downstream side. This latter piece is about 90 degrees different in direction from the wing wall.

The wing wall which is located on the top of the plateau on the south bank is being built on the solid rock which varies in elevation along here from 82.0 to 90.0.

Both the upstream side and the downstream side of the railway embankment will be carefully rip-rapped to prevent scouring action by wave action and rain.

Thus we will eventually have a head water elevation of 100.00 and a tail water elevation varying from 19.5 to 39.5. This gives an average working head of about 70 feet and the intention is to install a 10,000 h.p. unit. The total power to be generated will be for use in the Price Bros. mill at Kenogami, about 10 miles distant.

Complete and accurate information concerning the methods to be used in constructing the power house is not yet available, nor is it possible to say at this time what type of electrical mechanical equipment is to be installed.

New Bridge Across St. Maurice River at Grand Mere, P.Q.

For the last ten years the question of having a bridge erected on the St. Maurice river between the parish of St. Georges de Champlain and the city of Grand'Mere, P.Q., has been constantly discussed. The first scheme projected was a steel suspension bridge, for which plans were prepared by E. B. Wardle, chief engineer of the Laurentide Co., Ltd. This company even went as far as to spend approximately $58,000 in building two piers, one on each side of the river, for the purpose of carrying the proposed structure. These piers have since been used as landing piers for the ferry boat.

The company were anxious to use the piers to carry its project as first outlined, but the city manager, Henri Ortiz, before committing the city to heavy expenditure, had estimates prepared and submitted by the Dominion Bridge Company and the Canadian Bridge Company for both suspension and cantilever bridges.

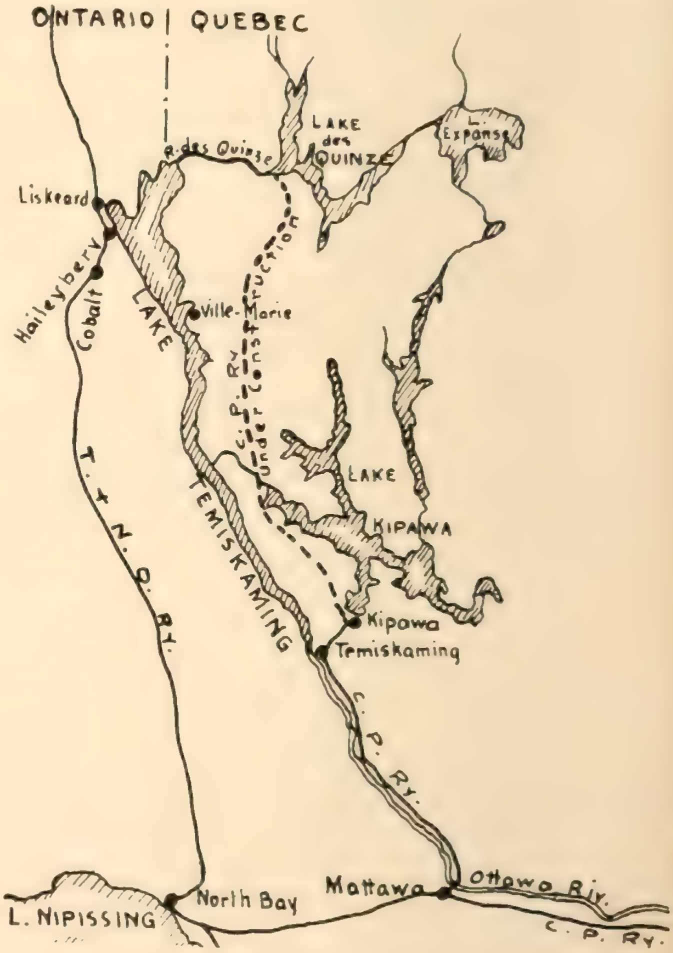
For a suspension bridge, ten feet wide with a wooden flooring covered with asphalt, the Dominion Bridge Co. submitted a tender of $507,000. For a cantilever bridge, 18 feet wide with the same kind of flooring, the cost was estimated at $531,000. To comply with the specifications of the government for a concrete flooring, an additional 30% should have to be added to the above estimates.

The estimate of the Canadian Bridge Co. was $505,000 for a suspension bridge, sixteen feet wide with a wooden flooring covered with asphalt, with an increase of ten per cent. on this amount for a structure eighteen feet wide. No price was submitted for the cantilever bridge.

Manager Ortiz also called for prices and designs for a through truss bridge, since the council felt that the above estimates would overburden the municipal budget. On the basis of an 18-ft. wide through truss bridge, the superstructure should cost about $175,000 and the foundations $150,000, a total of $325,000. The council is favourable to this last scheme on account of the difference in the cost as compared with the two other plans. The final consideration to be submitted to the council is a report on the bearing power of the river bed. Mr. Geo. Cahoon, president of the Laurentide Company is granting one thousand dollars to help the town to carry out this work.

C. P. R. Extension in Northern Quebec

Good progress has been made so far on the construction of the Canadian Pacific Railway extension from Lake Kipawa through Temiskaming County, Que., to its terminal at River des Quinze. The new extension will be 70 miles long, of which about 40 miles are graded and about 20 miles are laid with rail. The new line will also include a branch from a point some 20 miles south of des Quinze, to Ville-Marie, the principal town of the Temiskaming district. The extension will contribute to a large extent to the opening up of a territory immensely rich in mines, water powers and forests, for it is a well-known fact that the entire area from Lake des Quinze to Lake Abitibi is most highly mineralized



Location of C.P.R. extension to Lake des Quinze, P.Q and is only waiting better railway facilities for its development. The waterfalls of the des Quinze river are also known to be capable of great power development. The accompanying map shows the approximate location of the line and the territory which it will traverse. Messrs. Angus & Taylor, of North Bay, Ont., are the contractors.

Standard Specifications for Concrete Blocks

The committee on standard building units of the American Concrete Institute submitted a report at the annual meeting of the Institute, held on Jan. 22-25, which proposes standard specifications for concrete building block and concrete building tile. These specifications are as follows:—

1. The purpose of these specifications is to define the requirements for concrete building block and concrete building tile to be used in construction.

2. The word "concrete" shall be understood to mean portland cement concrete.

Strength Requirements

3. According to the strength in compression 28 days after being manufactured or when shipped, concrete block and concrete tile shall be classified as A—heavy load bearing, B—medium load bearing, C—light load bearing, and D—non-load bearing on the basis of the following requirements.

A—Heavy load bearing block or tile	1,200	1,000
B—Medium load bearing block or tile ...	700	600
C—Light load bearing block or tile	500	400
D—Non-load bearing block or tile	250	200

4. The gross cross-sectional area of a one-piece concrete block or tile shall be considered as the product of the length times the width of the unit as laid in the wall. No allowance shall be made for air spaces in hollow units. The gross cross-sectional area of each unit of a two-piece block or tile shall be considered the product of the length of the unit times one-half the thickness of the wall for which the two-piece block or tile is intended.

5. The compressive strength of the concrete in units of all classifications except class "D" shall be at least 1000 lb. per sq. in., when calculated on the minimum cross-sectional area in bearing.

Absorption Requirements

6. Concrete building block and tile to be exposed to soil or weather in the finished work (without stucco, plaster or other suitable protective covering) shall meet the requirements of the absorption test.

7. All concrete building block and tile not covered by paragraph 6 need not meet an absorption requirement.

8. Concrete block and tile shall not absorb more than 10 per cent of the dry weight of the unit when tested as hereinafter specified, except when it is made of concrete weighing less than 140 pounds per cubic foot. For block or tile made with concrete weighing less than 140 pounds per cubic foot, the absorption in per cent by weight shall not be more than 10 multiplied by 140 and divided by the unit weight in pounds per cubic foot of the concrete under consideration.

Sampling

9. Specimens for tests shall be representative of the commercial product of the plant.

10. Not less than three and preferably five specimens shall be required for each test.

11. The specimens used in the absorption test may be used for the strength test provided they have been dried at approximately seventy (70) degrees Fahrenheit for not less than three days.

METHODS OF TESTING

Strength Test

12. The specimens to be tested shall be carefully measured for overall dimensions of length, width and height.

13. Bearing surfaces shall be made plane by capping with plaster of paris or a mixture of portland cement and plaster which shall be allowed to thoroughly harden before the test;

14. Specimens shall be accurately centered in the testing machine;

15. The load shall be applied through a spherical bearing block placed on top of the specimen;

16. When testing other than rectangular block or tile care must be taken to see that the load is applied through the center of gravity of the specimen;

17. Metal plates of sufficient thickness to prevent appreciable bending shall be placed between the spherical bearing block and the specimen;

18. The specimen shall be loaded to failure;

19. The compressive strength in pounds per square inch of gross cross-sectional area is the total applied load in pounds divided by the gross cross-sectional area in square inches.

Absorption Test

20. The specimens shall be dried to constant weight at a temperature of from two hundred and twelve (212) to two hundred and fifty (250) degrees Fahrenheit and the weight recorded. After drying, the specimens shall be immersed in clean water at approximately seventy (70) degrees Fahrenheit for a period of twenty-four (24) hours. They shall then be removed, the surface water wiped off and the specimens re-washed. The absorption is the weight of the water absorbed, divided by the weight of the dry specimen and multiplied by one hundred (100).

Weight of Concrete

21. The weight per cubic foot of the concrete in a block or tile is the weight of the unit in pounds divided by its volume in cubic feet. To obtain the volume of the unit, fill a vessel with enough water to immerse the specimen. The greatest accuracy will be obtained with the smallest vessel in which the specimen can be immersed with its length vertical. Mark the level of the water, then immerse the saturated specimen and weigh the vessel. Draw the water down to its original level and weigh the vessel again. The difference between the two weights divided by 62.5 equals the volume of the specimen in cubic feet.

Exhibitors at A.C.B.C.I. Conference

(Continued from page 146)

Canadian Surety Co.,....................	Toronto.
Ignace Bilodeau, Ltee.,....................	Quebec.
National Fireproofing Co.,.................	Toronto.
U. S. Fidelity and Guaranty Co.,...........	Toronto.
The "Contractor,".........................	Toronto.
Taylor-Forbes Co. Ltd.,......................	Galt.

The Contract Record's

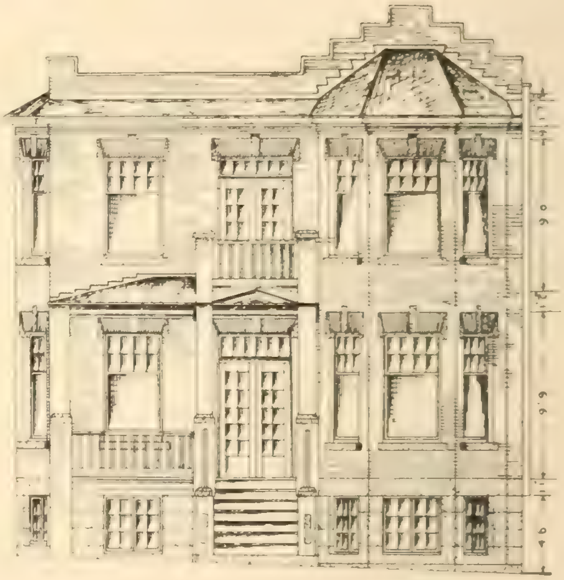
Weekly House Suggestion No. 56

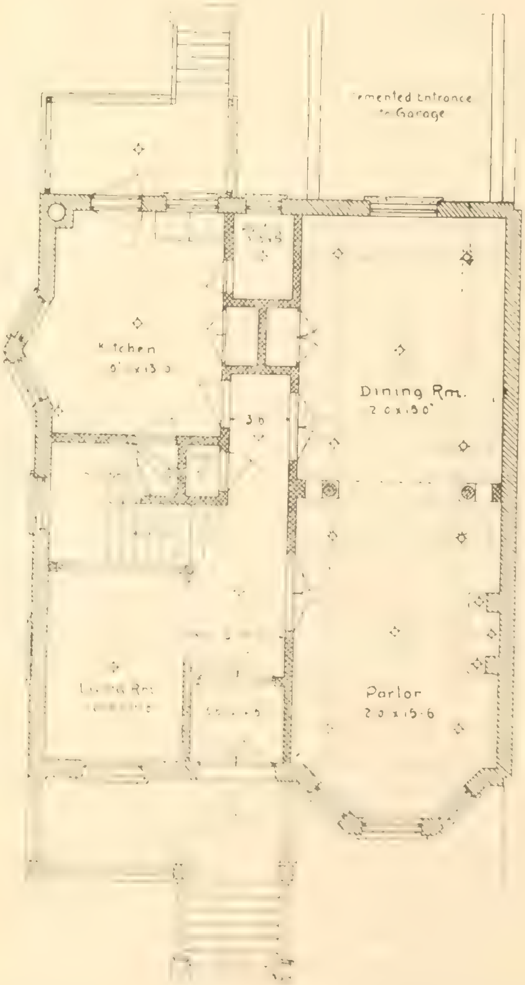
This week we show a cottage built at Montreal at a cost of $12,000 and designed by Mr. P. L. W. Dupre, architect of that city. The house measures 28 ft. in width by 34 ft. in depth. The construction is solid brick ornamented with natural stone. The ground floor comprises a parlor 12 x 15.6 ft. provided with a fireplace. The dining room measures 12 x 15.6 ft. also, and is separated from the parlor by an arch supported on columns. On the opposite side of the hall there is an 8 x 11 ft. living room with book cases along the walls. The kitchen measures 10 x 13 ft. with a 3½ x 5 ft. pantry and glass cupboard. The vestibule in finished in tile.

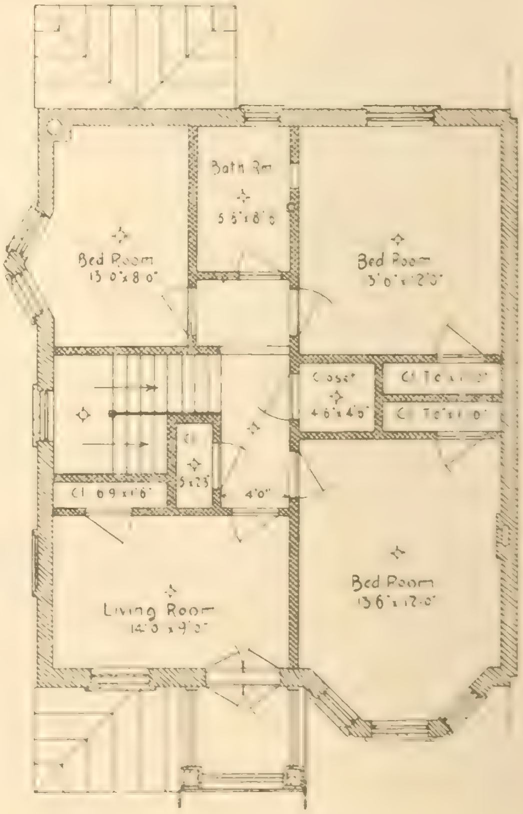
The upper floor comprises two large bedrooms and a smaller one; also a second living room of 9 x 14 ft. All the bedrooms are provided with ample storage space. The bath room is finished in tile.

The cellar is divided so as to provide a finished space of 11.9 by 32 ft. for a fireproof garage.

All floors are made of No. 1 cherry, and all woodwork finished in plain oak.







Rink at Coleman, Alta.

A combined skating and curling rink was recently completed by the Coleman Crystal Arena Ltd., of Coleman, Alta., at an approximate cost of $18,000. The skating rink is 200 by 105 feet with 105 foot steel trusses on 12 by 12 feet posts, which rest on concrete footings. The curling rink is a lean-to 65 by 175, with four rinks of ice. Messrs. Lindoe and Hall were the designers and engineers with Mr. J. D. Applonia, as contractor.

Mainly Constructional

East and West—From Coast to Coast

The Renfrew County Council has decided on the issue of $100,000 debentures to finance permanent work on the county good roads system.

The Western Canada Flour Mills Company propose building an addition costing $300,000 to their present elevator at Goderich, Ontario.

A committee has been appointed from the business men of Tillsonburg to secure figures on the cost of building a community rink.

The Montreal Branch of the Engineering Institute of Canada have, through their executive, appointed a committee to study the coal shortage situation in every possible way.

A statement to the effect that there was an attempt to introduce again the contract system for civic construction work in London, Ont., has been denied by Mayor Wenige.

At last week's convention of the International Association of Master Painters and Decorators held in Toronto, Mr. Peter Gydesen, of Minneapolis, pointed out that the only way to overcome the dull times bogey was by advertising. He claimed that Minneapolis is now an all-year round painting and decorating city. Other speeches made at the convention dealt with wall papers—when the present-day product came in for considerable criticism because of its softness and pulpiness; the chemistry of paint, and various features of the decorator's art.

The chairmen of the local committees that arranged the convention details were: William Paris, general chairman, W. W. Bamlett, chairman of Finance Committee; M. Sinclair, chairman of Entertainment Committee; W. M. Weeks, chairman of Hotels Committee; S. C. Taylor, chairman of Reception Committee; J. Phinnemore, chairman of Publicity Committee.

The city council of Edmonton have decided to apply to the Department of the Interior for a lease of 1,920 acres of tar sand lands. It is hoped within a short time to be able to use the material for sidewalks and pavements.

A press report states that Messrs. Tomlinson, McCaw and McDonald of Winnipeg, contractors for the Chippawa intake, have applied to the Hydro Commission for relief, owing to their tender being too low.

At a recent session of the Middlesex County Council, a recommendation was made for the construction of a new bridge at Dorchester over the Thames River.

The City Utilities Commission of Kingston decided recently to build a $40,000 addition to their present office building.

General Manager E. V. Buchanan of the public utilities London, Ont., recently pointed out that enough money can be saved through the meter system either to reduce the water rate, or after paying for the purchase and installation of the meters, within two or three years, turn a large annual surplus over to the city treasury.

James Howden & Co., of Glasgow, recently quoted a price of $203,150 on two 5,000 kw. turbines and one 1,000 kw. turbine for the standby plant projected by the Winnipeg City Council.

Mr. H. A. Terreault stated that Sherbrooke Street, Montreal, will be paved from Delorimier Avenue to Montreal East, a distance of five miles.

It is reported that construction work on the new C.P.R. pier at Vancouver will be rushed as soon as weather conditions permit.

The City Council of St. Thomas, Ont., decided on considerable street improvement with asphalt.

The Woodward Grain Company are commencing the construction of a grain elevator of ultimate million bushel capacity in Vancouver, at the end of February.

A collegiate institute of fourteen class-rooms is recommended for construction by the building committee of the Hamilton city council. The new building will be situated on the Harris property.

There is keen competition for gravel in Essex and Kent counties, Ontario. A 30-acre pit near Blenheim was recently sold for $35,000.

Chatham Builders' Exchange is growing in membership and the advisability of securing larger quarters to accommodate the membership was recently discussed.

The erection of fifty-eight dwellings in Campbellton, N. B., has followed as a direct result of the $200,000 loan secured under the Government Housing Scheme Grant.

A fight to obtain five years' extension on time allowed for provincial participation in the $20,000,000 federal road grant of 1919, and a second grant of $20,000,000 to run for a succeeding five years, now is being organized in the Western provinces by the Canadian Good Roads Association.

The gangs and train crews, who have been endeavoring to reach Kettle Rapids, the end of steel on the Hudson Bay Railway, have returned to The Pas. They report that parts of the line are in very bad condition.

The Hamilton harbor board, as a safety measure, has decided to remove the remains of the old Donald swimming baths at the foot of Bay street. The board will take steps to have about 50 piles pulled up while the ice is on the bay.

T. B. McQuesten, a member of the Hamilton parks board stated recently that the board had practically decided to establish pools in at least two parks this season.

Personal

City Engineer Brazier of London has resigned. He states that he will enter partnership with W. J. Boss, in the Boss & Brazier Construction Company.

Dr. Philip T. Crat, professor of architectural design in the University of Pennsylvania, is at the University of Toronto to give special instruction for a few days to the students in the department of architecture.

Obituary

Mr. George Lester, of Ottawa, prominent in local building circles, recently died.

George Clatworthy, president of the building and contracting firm of Clatworthy & Son, died recently. He had been long engaged in this field in Toronto.

Thos. K. Benson, a well-known carpentering contractor of Toronto, died recently.

CONSTRUCTIONAL ACTIVITY

Period of Feb. 7 to Feb. 13, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Eastview, Ont.
Ottawa Gas Co., Sparks St., will make extensions on various streets this spring. A. A. Dixon, superintendent.

Nelson, B. C.
Council has approved of sewer construction to the extent of $56,000. W. E. Wasson, City Clerk.

New Toronto, Ont.
Public Utilities Commission contemplate an intake pipe at a cost of $40,000. Soundings of the lake will be taken in May. T. C. Barrett, secretary.

Ottawa, Ont.
Ottawa Suburban Roads Commission contemplates the purchase of bituminous road material. Allan K. Hay, engineer.

Estimates are passed and tenders will be called by the Ottawa Suburban Commission for 3,000 lineal feet of culvert pipe.

CONTRACTS AWARDED

Toronto, Ont.
P. Licastro, Dufferin St., has been awarded a contract for sewers for the city at a cost of $15,321.

Railroads, Bridges and Wharves

Belleville, Ont.
County Council has proposed to build a bridge across the Bay of Quinte at a cost of $250,000. A. H. Chapman, clerk.

Dragon, Que.
Iron bridge 60 ft. long contemplated by Northern Explosives Ltd., Rigaud.

Hamilton, Ont.
If the City Council ratifies the by-law Dominion Power Transmission Co. will complete the extension of its lines into the McKittrick Survey by June 1.

Hawkesbury, Ont.
Bridge from Hawkesbury, Ont. to Grenville, Que. proposed at a cost of $200,000.

Kamloops, B. C.
Wm. Greenlees, Vancouver, B. C., has the general contracts for a bridge near Kamloops at a cost of $9 000 and another near Sheep Creek.

Lotbiniere, Que.
Tenders are being received until Mar. 14 for a steel bridge between St. Emelie and Lotbiniere. J. Bedard, Ste. Croix, County Lotbiniere, secretary.

CONTRACTS AWARDED

Ottawa, Ont.
Betcherman Iron & Metal Works, Eastview, has the general contract for the removal of bridge spans from the Cummings St. Bridge.

Province of Ontario.
A. M. Cook, Belleville, has bridge contracts for the Provincial Government to the extent of $30,000.

St. Basil, N. B.
Allan Construction Co. Ltd., St. Stephen, has the general contract for a $14,000 bridge.

Public Buildings, Churches and Schools

Brampton, Ont.
Sunday School contemplated by Grace Methodist Church, Rev. G. R. Turk, pastor. Architect not yet appointed.

Brantford, Ont.
Sunday School costing $50,000 contemplated by congregation of Zion Presbyterian Church. F. W. Nicolls, Temple Bldg., architect.

Burlington Beach, Ont.
Beach Commission plans to build a Fire Hall and purchase apparatus. Col. J. J. Grafton, Burlington, member of the Commission.

Campbellton, B. C.
Community Hall costing $5,000 planned by the International Timber Co. S. D. Hage, resident manager.

Clinton, Ont.
Repairs to the Town Hall, recently damaged by fire to the extent of $6,000, will be commenced shortly. A. T. Cooper, mayor.

Egmont Bay, P. E. I.
Foundations are in for a church for the Roman Catholic Parish. Tenders on carpentry and roofing being received until Feb. 15. Chappell & Hunter, Charlottetown, architects.

Elgin, B. C.
Work will start at once on the $5,200 Community Hall. J. Anderson, architect.

Esterhazy, Sask.
This school district contemplates a building at a cost of $7,500.

Etobicoke Twp., Ont.
Bulk and separate tenders are being received by Walker & Gibson, Toronto, for a school costing $35,000.

Fernie, B. C.
Plans are being prepared for a four room addition to the High School. Tenders will be called soon. H. Whittaker, Parliament Buildings, Victoria, architect.

Hamilton, Ont.
Work will commence shortly on a collegiate in the east end. Building will contain fourteen rooms. Hutton & Souter, Bank of Hamilton Building, architects.

Building committee of the Board of Education has recommended a new collegiate be erected in the west end. R. H. Foster, secretary.

Keewatin, Ont.
Public School Board is having plans prepared for a $30,000 school. W. J. Craig, Keewatin, secretary.

Lawrenceville, Que.
L. N. Audet, King St. W., Sherbrooke, has prepared the plans for a $35,000 church and presbytery. Rev. O. Robin, priest.

London, Ont.
Plans are being prepared for a monastery for the Redemptorist Fathers to cost about $60,000. Watt & Blackwell, Toronto, are the architects. Tenders will be called about Mar. 1.

Magrath, Alta.
Plans are being prepared for a church at a cost of $12,000. J. A. Ririe, Magrath, Alta., interested.

Montreal, Que.
The general contract for a presbytery has been awarded to Jos. Marcotte & Co., St. Catherine St. E.

North Bay, Ont.
Fire damaged the school in West Ferris Twp. to the extent of $4,500. Board will rebuild at once. Jas Pasmore, clerk.

Ottawa, Ont.
Purchase of school furnishings to the extent of $78,000 included in the estimates for 1923.

Outremont, Que.
The Outremont Presbyterian Church contemplates an addition to the building this year.

Point Grey, B. C.
Work will commence at once on a hall for the Boy Scouts. Cost will be about $5,000. G. Walkem, reeve.

Richmond Hill, Ont.
Board contemplates a High School costing $100,000. Architect not yet appointed. Dr. R. Langstaff, chairman.

Ridgetown, Ont.
A $20,000 Community Hall is planned by the Citizen's Committee. Building will be equipped with a swimming pool, auditorium and other special features. H. McDonald, secretary.

St. Mary's, Ont.
Board contemplates an addition to the Public School at a cost of $15,000. Watt & Blackwell, London, architects.

Vernon, Ont.
About Apr. 1 work on $14,000 church will commence. Prices wanted on all brickwork and stonework. R. J. Robertson, Osgoode, Ont., secretary-treasurer.

Victoria, B. C.
Sub-tenders are wanted by the secre-

tary of the Royal Jubilee Hospital Board, Fort St., and will be received until Friday, Feb. 16.

Welwyn, Sask.
Ferndale School District is having plans prepared for a school to cost $4,500.

Waterloo, Ont.
Bulk tenders for an addition to the Separate School are being received by Ed. Dehler, secretary and J. M. Cowan, architect, Toronto, until Feb. 28.

CONTRACTS AWARDED

Charlottetown, P. E. I.
Cudmore & Webster, c/o Chappell & Hunter, architects, have the general contract for a $5,000 addition to the Methodist Church.

Ford, Ont.
Benning & Parker have the general contract for a Methodist Church at a cost of $11,000.

Point Grey, B. C.
University of British Columbia will recommence work on $650,000 Science building. General contract awarded to E. J. Ryan Contracting Co., Vancouver.

Plantagenet, Ont.
H. Maranda has the general contract for the Roman Catholic Church at a cost of $100,000. Ludger Venne, Osborne St., Montreal, architect. Excavating will start in April.

London, Ont.
Contract for glass in the $125,000 monastery for Sisters of the Precious Blood, has been awarded to the Hobbs Mfg., Co.

John Hayman & Sons Co. Ltd., Wellington St., have the general contract for an addition to the Memorial school at a cost of $30,000. L. E. Carrothers, architect.

Hobbs Mfg. Co., Ridout St., have the contract for 100,000 feet of glass for the Arts Building.

St. Coeur De Marie, Que.
Albert Giroux has the general contract for a church. Alf. Lamontagne, Chicoutimi, is the architect.

Business Buildings and Industrial Plants

Brantford, Ont.
Parks Board contemplate a boathouse and dance pavilion in Mohawk Park at a cost of $8,000. John Kerr, chairman.

Campbellton, B. C.
T. H. Hanson, Campbellton, will start at once to build a $8,000 store with with apartments above.

Dragon, Que.
Northern Explosives Ltd., E. E. Bard, manager, will build three sheds for the storing of munitions. Cost will be about $6,000.

Edson, Alta.
Theatre costing $6,000 is contemplated by J. A. Anderson.

Fort William, Ont.
Western Terminals Elevator Co., Winnipeg, Man., will commence work at once on $500,000 elevator. Fegles Construction Co., Fort William will purchase materials and let sub-trades. Conveying and elevating machinery to be purchased by owners.

Goderich, Ont.
Western Canada Flour Mills, Toronto, contemplate an addition to an elevator costing $300,000. Architect has not yet been appointed.

Hamilton, Ont.
Two stores and two apartments will be built by Norman Depew, Lorne Ave. Cost will be about $9,000.

Kitchener, Ont.
Alterations to the extent of $12,000 will be made to a business block owned by A. C. Merner, Trout Creek.

Leslie, Sask.
Pioneer Grain Co. Ltd., Winnipeg, contemplate an elevator at a cost of $8,500. W. M. G. Rait, manager.

London, Ont.
City Creamery Co., Dundas St., will make a $3,000 addition to their building. J. Griffiths, manager.

Tenders will be called by Watt & Blackwell, for a $15,000 factory for Orange Crush Bottlers Ltd. Prices wanted on all materials and machinery for bottling.

Moncton, N. B.
W. A. Humphrey & Son, Mechanics St., contemplate an addition to their garage at a cost of $5,000.

North Atlantic Salt & Chemical Co. recently organized with a capital of $500,000 contemplate a salt refining plant. Address, J. C. Rand, c/o Robinson & Rand, Matthew Lodge, Union Station.

Montreal, Que.
S. Marotta, St. Catherine St., has the general contract for stores and flats for Mrs. N. Duhamel, Ontario St., costing $25,000.

Mount Dennis, Ont.
Russell & Russell, Weston Rd., will commence work in the spring on stores and apartments in Mount Dennis.

Oakville, Ont.
Bank of Hamilton, contemplates a two storey building for a branch and offices.

Petrolia, Ont.
Plans are being prepared for a gasoline service station costing $7,000. D. Morris, manager.

Port Arthur, Ont.
Tenders are wanted for a terminal elevator costing $900,000 by the Bawlf Grain Co. Ltd., Winnipeg, Man. Tenders for the general contract will be received until Feb. 27.

St. Lambert, Que.
Plans are drawn for a $50,000 factory for the Liberty Tire & Rubber Co., St. James St. J. O. Gourre, manager.

Stratford, Ont.
Plans for the proposed factory for Stratford Frames and Novelties Co. costing $28,000 are being revised and new tenders will be called about the end of the month. N. M. Upshall, Adelaide St. W., Toronto, president.

Toronto, Ont.
Standard Bank of Canada has purchased the site for a branch in the Danforth district. Work may not commence until next year.

Two small branches contemplated by the Canadian Bank of Commerce. Dominion Realty Co., King St. W., architects.

George McIntyre, Burlington Cres., is receiving tenders for heating, electrical work and plumbing, and is interested in the prices on all machinery, for a stone cutting factory.

Doyle Motors, Ltd., High St., contemplate a garage. Bernard Doyle, manager.

Tenders are being received for wiring a $50,000 factory by Independent Concrete Pipe Co., Harbor Commissioners Building. Manager James Carnwath, Room 502.

Tenders will shortly be called for an eight storey office building and automatic exchange for the Bell Telephone Co. Ltd., Adelaide St. W. W. J. Carmichael, architect.

Vancouver, B. C.
E. A. Woodward Co. Ltd., Winnipeg, Man., want tenders on an elevator costing $640,000. Tenders will be received until Feb. 28.

False Creek Lumber Co., Vancouver, are rebuilding a saw mill at a cost of $15,000. Machinery to be purchased.

L. G. Thomas, Beach Ave., Vancouver, will build a store and residence costing $10,000. Gardiner & Mercer, Birks Bldg., architects.

Ice Delivery Co., Homer St., will build a garage costing $7,000.

Verdun, Que.
Stores and flats costing $7,500 contemplated by E. Deschenaux, Evelyn St.

Waterloo, Ont.
A warehouse costing $6,000 contemplated by Ellert Bros., Park Ave.

Whonnock, B. C.
Sawmill costing $5,500 to be built by Philpot & Whiting.

Windsor, Ont.
Two stores and six apartments costing $18,000 are being built by Peter Osterhout, Exchange Bldg. Contracts for plumbing, heating and plastering not yet let.

Winnipeg, Man.
Innis Bros., Atlantic Ave., are having plans prepared for a garage to cost about $8,000. Tenders will be called shortly.

CONTRACTS AWARDED

London, Ont.
Steel contract for $50,000 auto show room for Middlesex Motors has been awarded to H. C. Lefroy Engineering Co., Toronto. Peoples' Electric Co., Dundas St., London, have the electrical contract and Eggett & Co., Ridout St., have contracts for plumbing and heating.

Rondeau, Ont.
The general contract for rooming house and restaurant has been awarded to S. B. Nichol, Blenheim, Ont. C. V. Grant, Ridgetown, owner.

Toronto, Ont.
Jas. A. Wickett Ltd., has been awarded the general contract for alterations to the Bell Telephone "Adelaide" exchange.

Ontario Engineering & Foundation

[illegible] Wittard Ave. has the contract for excavating for three stores for N. Fegelman, Markham St.

Vancouver, B. C.

Contracts have been awarded as follows on $150,000 apartment store for Woodward Departmental Stores Ltd.: Stone, Keast & Allan, Beach Ave.; structural steel, J. Coughlan & Sons; cast iron cases, Ross & Howard; terazzo flooring, P. Ferrero.

Windsor, Ont.

Contract for sheet metal for the wash house and storage for the British American Brewery awarded to Pennington & Laing, Caron Ave. Miscellaneous iron, Border Cities' Wire & Iron Works, Walkerville.

Cormie Bros., Windsor Ave., have the plastering contract for a $50,000 business block under construction by Baxter Hardware Co., Pitt St. E.

Winnipeg, Man.

E. H. Herb, Balmoral Place, will commence work at once on a store costing $15,000. A. S. Gilker has the general contract and will purchase all material and let sub-trades.

Residences

Cornwall, Ont.

Residence costing $10,000 contemplated by J. E. Plumandon, First St.

Coteau Station, Que.

A. O. Ranger, Coteau Station, will commence work shortly on two flats costing $4,000 each.

Essondale, B. C.

$5,000 residence planned by Provincial Government. Henry Whittaker, Parliament Buildings, Victoria, architect.

Hamilton, Ont.

Work on a $10,000 residence for J. V. Vagan, Sanford St., will be commenced by Sullivan & Son, Charlton St. W., in the spring.

Hanover, Ont.

J. J. Spiez, Hanover, contemplates a residence at a cost of $20,000. Chas. Knechtel, Courtland Ave., architect.

Islington, Ont.

O. G. Harris, Islington, has the walls up for a house costing $4,500.

Kitchener, Ont.

Four residences costing $4 000 each proposed by Dunker Bros., owners and general contractors.

Plans are being prepared for a $8,000 residence for Dr. U. B. Shantz, King St.

Lachine, Que.

Scott & Bell will call tenders on a cottage. Cardinal & Beauchamp are the general contractors.

Lake Simcoe, Ont.

A. L. Sanagan, St. Leonard's Ave., Toronto, has excavated for 12 residences, brick on stone foundations.

London, Ont.

New tenders will be called about the middle of March on an apartment house costing $25,000. Chas Brennan, Picton St., owner and W. G. Murray, Dominion Savings Bldg., architect.

L. G. Bridgman, Bank of Commerce Bldg., is receiving tenders on two residences costing $8,000 each.

Milverton, Ont.

Two residences costing $4,000 each contemplated by J. Beller, R. R. No. 1 Milverton.

Montreal, Que.

D. Crevier, St. Dennis St., general contractor, will call for tenders on three flats to cost $14,000. Work may start early in the summer.

Lucus & Scoups, St. Dennis, contemplate three flats at a cost of $7,500. Will let sub-trades and buy materials as required.

J. Marceau, Chabot St., is excavating for a residence costing $8,000. Buying materials as required.

Ottawa, Ont.

G. Conley, Coburg St., is having plans prepared for an apartment house.

Walls are going up for a $5,000 residence for R. Nichol, Westboro.

Point Grey, B. C.

A. Haddock, Trafalgar Ave., proposes to build a residence costing $4,000.

H. T. Green, Vancouver, will commence work at once on a residence costing $4,000.

W. J. Reid, 13th Ave., Vancouver, will build a residence costing $10,500. Townley & Matheson, Homer St., are the architects.

St. Lambert, Que.

Tenders to be called on Feb. 26 for residences proposed by the Metropolitan Housing Co., Montreal, at a cost of $100,000. Alcide Chausse, Notre Dame W., Montreal, architect.

St. Catharines, Ont.

Mr. Kemp, Beecher St., will build a residence costing $4,000 in the spring.

Plans for 10-18 residences are being prepared by Allan Gogo, Facer St. No material purchased and contracts for electrical, plumbing, heating, plastering and painting to be let.

Sanford, Man.

W. J. Parker, Manitoba Agricultural College, Winnipeg, is having plans prepared for a residence costing $5,000. Interested in prices on this work.

Stewart, B. C.

Cyril Jackson, Stewart, is excavating for a residence to cost $3,600.

Surrey, B. C.

$4,000 residence contemplated by H. Berrett, Scott Rd., who is preparing plans.

Terrebonne, Que.

Town Council will consider tenders submitted for the construction of 50 residences. Secretary, Mr. Beaupre.

Toronto, Ont.

As soon as weather permits work will start on five residences. W. Padfield, owner and builder.

Gaylord & Wood, Eaton Ave., have excavated for 2 pair of residences and will proceed with work in the spring.

J. & W. Arthur, Chester Ave., are excavating for two residences costing $4,800 each.

Albert R. Harper, Sherwood Ave., will commence work this spring on a residence costing $5,500.

Phylip Wyatt, Dagmar Ave., is excavating for two residences costing $5,000 each.

Two pair of residences costing $6,000 a pair being built by Branson & Taylor Gledhill Ave.

Residence costing $6,000 contemplate by John Bailey, Inglewood Dr.

Excavating is in progress for a pair residences to cost $6,000. J. Kritzer Keystone Ave., owner.

Seven pair of residences contemplate this spring by J. Kritzer, Keystone Av

W. A. Roder, Witlow Ave., will commence about March 15 to build 12 residences at a cost of $5,500 each.

Godson Home Building Co., Armadale Ave., want tenders on four duplex houses costing $12,000 each.

Two bungalows costing $5,500 each contemplated by A. Duncan, Hillary Ave

Four detached residences costing $4 500 each are contemplated by T. Padfield, Chisholm Ave.

Four residences contemplated by W H. Raine, Glencairn Ave. Work wil start about the end of March.

W. H. Kerwin, Keystone Ave., will commence work in the spring on five residences costing $5,000 each.

Geo. F. Skipper, Pine Cres., is excavating for 66 residences. No material purchased.

Marcel de Jonckhere & Chas. L. Reburn have formed partnership and will build a residence in Baby Point. Address, 179 Colbeck St., Toronto.

Willson & Horton, Lansdowne Ave., are excavating for a residence costing $8,000.

N. Parrington, 158 Symington Ave., is building a residence costing $7,500.

J. W. Clare, Rushton Rd., will build six residences in North Toronto, commencing about Mar. 1.

J. C. Raynor, Runnymede Rd., has purchased the site and proposes to build a residence costing $13 000.

Four bungalows contemplated this spring by Law & Smith, 1073 Bathurst St.

Vancouver, B. C.

Herbert R. Glass, Granville St., will start work at once on four residences costing $9,600.

Verdun, Que.

Six flats costing $8,000 contemplated by P. Lalonde, Lasalle Rd. Work will start in May.

Victoria, B. C.

Excavating is in progress for a $5,000 residence for H. Pierce, Metchosin St. K. B. Spugin, Sayward Bldg., architect.

Waterloo, Ont.

Otto Reiber has had plans drawn for a residence costing $6,000 and is receiving tenders on masonry.

Windsor, Ont.

H. Tulloch, Caron St., is excavating for a residence costing $5,000.

Peter Osterhout, Exchange Bldg., is

building two duplex residences costing $7 000 each.

Winnipeg, Man.
$10,000 residence being built by C. T. Lount, Union Bank Bldg. All material will be purchased by owner.

CONTRACTS AWARDED

Montreal West, Que.
J. H. Dogson, St. Catherine St. W., has the tiling contract for four residences costing $32,000.

Toronto, Ont.
Walls going up for 20 residences and G. F. Skipper, Pine Cres. has awarded the following contracts: Plumbing, L. Hollows, Danforth Ave.; plastering, J. Thompson, Gledhill Ave.; electrical, Nichol & Fagan, Logan Ave.

Verdun, Que.
Contracts on six flats costing $18,000 being built by H. Lamay, St. Emelie St., have been awarded as follows: Electrical, Valee & Hamelin, St. James St.; plastering Z. Bouchard, Bourget St.; sash and doors, J. Savage, St. Ferdinand St. & Dupuis Ltd., Church Ave.

Contracts on six flats costing $16,000 have been awarded as follows by U. St. Armand, builder: Brick, A. Remy; electrical, E. Robillard; plumbing, C. Malchelosse; plastering, O. Aubertin & Cie; sash and doors, J. P. Dupuis Ltd.

Contracts on three flats costing $12,000 have been awarded by P. Pelletier, Evelyn St., as follows: Brick, A. Remy, Gertrude St.; electrical, S. Quesnel, Church Ave.; plumbing, Perrier & Frere, Strathmore Rd.; sash and doors, Atlas Lumber Co., Lafontaine St.

Walkerville, Ont.
Painting contract for a residence costing $18,000 has been awarded to W. T. Brooke & Son, Pitt St. W. H. White, Ouelette Ave., owner.

Windsor, Ont.
On a double residence costing $15,000 L. A. Deziel, Pelissier St., has awarded the following contracts: Roofing, Yatt & Corbin; plastering, W. E. Middleton; painting, W. T. Brooe, Pitt St.

Power Plants Electricity and Telephones

Powell River, B. C.
Tenders are wanted on the first unit of a $110,000 steam power plant by the Powell River Co. Ltd., Vancouver, N. R. Lang, manager will receive tenders for concrete power house and smoke stack.

St. Etienne Des Gres, Que.
Work is in progress on the $7,000,000 water power development work for Shawinigan Water & Power Co. Ltd., Montreal. Steel is the only contract to be let. Other work will be done by day labor.

St. John, N. B.
The purchase of 80 ornamental lamp standards for street lighting at a cost of $25,000 is being considered by the City Council. L. G. Hare, engineer.

General contract for sub-station costing $100,000 has been awarded by the Civic Hydro Commission to H. O. Clark, Water St. Barry Wilson, City Hall, electrical engineer.

CONTRACTS AWARDED

Sheet Harbor, N. S.
The general contract for dams in the Nova Scotia Power Commission's development scheme between Malay Falls & Hopewell has been awarded to Nova Scotia Road Builders, Kentville, at $111,580.

Miscellaneous

Bolton, Ont.
Laurel Hill Cemetery plans a new entrance to the grounds. Sec.-treas., J. F. Warbrick.

Hamilton, Ont.
Swimming pools contemplated by the City Council. T. B. McQuesten, Jackson St. W., member of the Parks Board.

City Council & Harbor Commission contemplate a bathing beach. E. R. Gray, engineer.

Kitchener, Ont.
Foundations in for a $75,000 mausoleum containing 370 crypts. Cameron & Ralston, Windsor, architects.

Ottawa, Ont.
Commissioner of Works will receive tenders until Feb. 20 for supplies as advertised on page 57, Feb. 7 issue, Contract Record.

Ottawa Suburban Roads Commission will call for tenders on 2,000 bbls. of cement. A. K. Hay, engineer.

Thamesville, Ont.
Plans are to be prepared for the Citizen's Committee for a rink. D. E. Wallace member of the committee. Building will cost about $10,000.

Three Rivers, Que.
Chas. Goude, Lavoilette St., and Frank Panneton, Boulevard Turcotte, have formed a partnership, and will open an office as engineers and agents for building material.

CONTRACTS AWARDED

Toronto, Ont.
Dominion Government has awarded the contract for repairing a dredge to Toronto Dry Dock Co. Ltd. at a cost of $10,675.

Fires

Kemptville, Ont.
Fire destroyed a $25,000 business block owned by W. C. Guy.

Lauzon, Que.
Davie Ship Building & Repairing Co. suffered a loss of $100,000 when their machine shop was destroyed by fire.

London, Ont.
H. J. Jones & Sons Ltd., Dundas St., sustained a loss of $50,000 when fire destroyed their lithographing plant. Rebuilding will commence shortly and owners are interested in prices.

Warehouse owned by Reid Bros. destroyed at a loss of $100,000. Owners will rebuild at once. G. M. Reid, 262 Central Ave., president.

Montreal, Que.
Office building owned by J. O. Gravel, Notre Dame St., destroyed by fire. Loss will be about $85,000. Owner will rebuild shortly.

Plessisville, Que.
Mica factory owned by La Fondrie de Plessisville Ltd., burnt down and loss will be about $10,000.

St. Agothe, Que.
Fire destroyed a store, residence and shed owned by Martin & Frere at a loss of $15,000.

Sorel, Que.
The Balmoral Hotel destroyed at a loss of $60,000. Will probably be rebuilt shortly, A. Demaris, manager.

Three Rivers, Que.
Grand Central Hotel, owned by Henri Bureau, damaged by fire to the extent of $6,000. Repairs will be made immediately.

$10,000 loss when repair shop owned by A. Pratte was destroyed by fire.

Late News

Brooklin, Ont.
Because the present building has been condemned the Board contemplates a new school at a cost of $30,000. W. S. Croxall, Brooklin, interested.

Calgary, Alta.
Warehouse owned by the Great West Saddlery Co. Ltd., partially destroyed by fire, will be rebuilt. G. E. Fairburn, manager.

Corinne, Sask.
International Elevator Co., Winnipeg, Man., contemplate a $9,000 addition to their elevatod. J. C. Gage, manager.

Montreal, Que.
Plans are being prepared for the School Board for a 22 room school, including a gymasium and cookery room. Cost will be about $250,000. Building Inspector, Mr. Palmer, 36 Belmont St. J. S. Archibald, architect.

Moose Jaw, Sask.
Tenders are wanted by the C. P. Rly. for a station and section houses. General Superintendent, W. A. Mather.

Paris, Ont.
F. C. Bodley, Temple Bldg., Brantford, is preparing plans for a High School.

Petitcodiac, N. B.
An ice cream plant is contemplated by the Purity Ice Cream Co. Ltd., St. John. The work may proceed in March.

Plum Coulee, Man.
Manitoba Telephone System, Winnipeg, has purchased a site and plans to erect an exchange this spring.

Point Grey, B. C.
R. C. Kidd, Richards St., Vancouver, will stare work at once on a residence

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

Tenders for School

Bulk tenders only, will be received by Edward Dehler Esq., Secretary, Separate School Board, Waterloo, Ont., until

February 28th, 1923

for all trades required in the erection of addition to school building at Waterloo, Ont.

Tenders to be sent by registered mail only.

Plans and specifications may be seen at the office of Edward Dehler, Waterloo, Ont., or at the office of the undersigned. A deposit of ten dollars, returnable, will be required on all plans.

The lowest or any tender not necessarily accepted.

J. M. COWAN, Architect,
991 Bay Street, Toronto.
6-7

The Quebec Streams Commission

Proposed Storage Dams at Lake Kenogami

Notice to Contractors

SEALED TENDERS addressed to the undersigned and marked "Tenders for Storage Dams at Lake Kenogami" shall be received at the office of The Quebec Streams Commission, Parliament Buildings, Quebec, until Twelve o'clock, on

Tuesday, the 20th of February 1923.

Plans and specifications can be seen on or after this date at the office of the Commission, 59 Notre Dame Street East, Montreal.

Parties tendering shall be required to accept the fair wages schedule prepared or to be prepared by the Department of Labor of the Province of Quebec, which schedule shall form part of the contract.

Tenderers are notified that tenders shall not be considered unless made strictly in accordance with the printed forms.

An accepted bank cheque for the sum of One Hundred and Fifty Thousand Dollars ($150,000.00) made payable to the order of the Provincial Treasurer, must accompany each tender, which sum shall be forfeited if the party tendering declines entering into contract for the work, at the rates stated in the offer submitted. The cheque of the successful tenderer shall be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By Order
O. LEFEBVRE, Chief Engineer,
The Quebec Streams Commission,
59 Notre Dame Street, East,
Montreal, Jan. 22nd, 1923.

Newspapers inserting this advertisement without authority from the Commission will not be paid for it.
5-7

QUANTITY SURVEYOR Fully qualified in all branches of the profession open for engagement. Apply Box 120, Contract Record, Toronto.
6-9

RATES

20 cents per agate line (14 lines to the inch) Positions Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

ONTARIO

Notice to Contractors

Separate sealed tenders marked "Tender for Contract No. ...." will be received by the undersigned until 12 o'clock noon on **Wednesday, March 7th, 1923**, for the following work on the Provincial Highway.

Concrete Pavements

Contract No.	916	Kitchener west 3.11 miles.
"	862	Welland westerly 1.4 miles.

Asphaltic Concrete Pavements

Contract No.	939	Stittsville to Bells Corners 7.5 miles.

Macadam Base Course

Contract No.	865	Farran's Point westerly 3.7 miles, including grading.
Contract No.	866	Clarence and N. Plantagenet 5.5 miles.
Contract No.	876	Farran's Point easterly 3.0 miles, including grading.
Contract No.	941	Cayuga to Nelles Corners 4.8 miles.
Contract No.	960	Perth north easterly 5.0 miles, including grading.
Contract No.	942	From 1¼ miles west of Summerstown westerly 1.9 miles including grading.

Grading

Contract No.	867	Walkerton westerly 7.1 miles
" "	868	Harriston westerly 4.8 miles
"	869	St. Davids to Queenstown 1.0 miles.
"	871	Beckett's Bridge to Fork's road 2.3 miles.
"	872	In Delhi 0.4 miles.
"	873	St. Thomas to Aylmer 9.4 miles.
" "	874	Proof Line from Sarnia Gravel Road north 1.6 miles
"	875	Cadedonia to Hagersville 4.0 miles.
" "	914	Hagersville to Jarvis 5.1 miles.
" "	877	Sligo Hill.
"	878	North Creek.
" "	880	Chatsworth S.E. 3 miles.
" "	881	Chatsworth northerly 3.6 miles.
" "	961	Washago south 4.7 miles.
"	848	St. Marys east and west in all 4.8 miles.

Surface Treatment of Macadam Roads with Tar

Contract No.	882	Niagara Falls to Welland 13.2 miles.
	883	Dunnville to Cayuga 10.4 miles.
	884	Caledonia to Hagersville 7.9 miles.
	885	[illegible] 9.5 [illegible]

Bridge Substructures and Overhead Crossings

Contract No.	933	Arthur Bridge.
"	934	Credit River in Norval 2 Bridges.
	935	Over C P R [illegible] Hill.
"	936	Aux Sable River Bridge.
"	917	South of Brampton 2 Bridges and Sligo Hill Bridge.

Concrete Culverts

Contract No.	886	Carrick Township.
"	887	Brant, Greenock & Kinloss.
" "	888	Kincardine.
" "	889	Holland, Sullivan, Derby and Sydenham.
"	890	Artemesia, Glenelg, and Holland,
"	891	Holland.
" "	892	Melancthon.
"	893	Proton, Artemesia and Melancthon
"	940	Artemesia and Glenelg.
" "	956	Normanby, Egremont, Bentinck and Glenelg.

Plans, specifications, information to bidders, tender forms, and tender envelopes may be obtained on and after **Wednesday, February 14th, 1923**, at the office of the undersigned, or from the following Resident Engineers.

H. C. Rose, Guelph,
R. MacLennan, Cayuga,
D. W. Bews, Port Hope,
D. H. Philp, Toronto,
F. Brinkman, L'Orignal,
G. A. Downey, Walkerton,
J. M. Empey, St. Mary's,
J. G. Smith, St. Thomas,
J. A. Tom, Stratford,
R. MacLennan, Simcoe,
C. H. Nelson, Whitby,
G. G. Greig, Waterdown,
C. A. Robbins, Durham,
C. E. Bush, Orangeville,
A. Earchman, Carleton Place,
A. H. Parker, Cornwall,
A. N. Fellowes, St. Catharines,

A marked cheque for $1,000.00 payable to the Minister of Public Works and Highways, or a Guaranty Company's Bid Bond will be required on all tenders for pavement. A Marked Cheque for $500.00 payable to the Minister of Public Works and Highways, or a Guaranty Company's Bid Bond will be required with all tenders for culverts or grading. A Guaranty Company's Contract Bond for 50% of the amount of the tender will be required when the Contract is signed.

The lowest or any tender not necessarily accepted.

All bonds must be made out on forms furnished by the Department.

W. A. McLEAN,
Deputy Minister of Highways,
Department of Public Highways, Ontario.
Toronto, February 7th, 1923.
7

FOR SALE

Byers No. 3 Auto Crane, road wheels: 38 ft. boom, [illegible] yard Clam capacity 350 yards per day, located Windsor. Specifications and terms apply Cadwell Sand & Gravel Co. Ltd., Windsor, Ont.
7-10

Third Extension of Time

Notice is hereby given that the time for the reception of tenders for the Esquimalt, B.C. Dry Dock Machinery, is further extended to Thursday, March 15, 1923.

By Order,
R. C. DESROCHERS,
Secretary,
Department of Public Works,
Ottawa, February 7, 1923. 7

Tenders Wanted

Tenders for the Erection of a One Storey and Basement Four Roomed Public School in the Town of Newmarket, Ontario

General Tenders wanted to include Sewer, Excavation, Masonry, Reinforced Concrete, Brickwork, Hollow Tile, Cut Stone, Structural Steel, Carpentry, Joiner work, Steel windows, Glazing, Painting, Felt and gravel roofing and sheet metal work, Plastering, Terrazzo flooring, Plumbing.

Sealed lump sum Tenders marked "Tender for Newmarket School" to be mailed to the Architect not later than **Saturday evening 17th., February 1923.**

Plans and specifications may be seen at the Builders Exchange, Bond St., Toronto.

Also at the office of the Architect, Newmarket, Ont.

6-7 O. E. TENCH, Architect.

STEEL PILING

1000 tons 40′ long.
14″ x ⅜″ Arch Web.
7″ x ¼″ Straight Web.
All ready to load.
UNIVERSAL EQUIPMENT COMPANY,
1 T.f. Niagara Falls, Ont.

FOR SALE

Electric Travelling Cranes and Steel Crane Runways

STEEL CRANE RUNWAY—382 ft. long; height of columns 30 ft.; weight about 150 tons. Used for 15-ton Crane 80 ft. span.
1—CLEVELAND ELECTRIC TRAVELLING CRANE 80 ft. span; capacity 15 tons. At present in service on the above Runway.
STEEL CRANE RUNWAY—220 ft. long; height of columns 23 ft. Also 22 additional Girders each 20 ft., without columns, sufficient to extend Runway 220 feet additional. Total weight about 50 tons. Used for 7½-ton Crane 70 ft. span.
2—CLEVELAND ELECTRIC TRAVELLING CRANES—37 ft. span; one-15-ton capacity, and one 10-ton capacity, without Electrical Equipment.

Ask for prices and further particulars, also a complete list of our second hand machinery.

The Maritime Bridge Co., Limited
New Glasgow, Nova Scotia
6 T.f

RELIABLE YOUNG MAN—would like to get agency from wholesale lumber concern, to sell in Nova Scotia and Newfoundland on commission. Have had fourteen years experience in building and handling lumber. Can furnish references. Box 122, Contract Record, Toronto. 6-7

FOR SALE

Keystone Excavating Machine, complete with two sticks, skimmer scoop, and three ditching scoops; this machine has been used only one season and is guaranteed to be in first class condition. Price $4,500 f.o.b. St. John, N. B.

Austin Backfiller with caterpillar traction, 4-cylinder Buffalo engine, in equally good condition. Price $2,500 f.o.b. St. John, N. B. Canada Lock Joint Pipe Limited, 65 Pleasant Boulevard, Toronto, Ont.; or St. John, N. B. 6-T.f.

A Service to the Profession

Every man wishing to tender must first see the plans and specifications.

If the plans are in Montreal and he is in Vancouver the inspection is a problem. We, however, with your assistance, are able to solve it. Place them on file at any or all of the offices of the "Contract Record" throughout the Dominion.

Contractors, engineers and allied manufacturers read the "Contract Record." It is the logical publicity medium for the announcement of tenders wanted.

Send us your plans. They will receive the best of care.

A room is reserved in each of our offices for examination of your plans by possible bidders.

Contract Record
and Engineering Review

Toronto	345 Adelaide St., W.
Montreal	119 Board of Trade Bldg.
Winnipeg	302 Travellers' Bdg.
Vancouver	106 Winch Bldg.

GOOD BRICKLAYER foreman seeks position. Experienced in stone setting. Could take entire charge. Apply Box 134, Contract Record, Toronto. 7-8

OPEN FOR POSITION as foreman or superintendent, 20 years experience concrete bridge and culvert, pile driving, coffer dam work. References if necessary. Will go anywhere. Box 495, Burlington, Ont. 7-9

DRAFTSMAN WANTED for Brantford Architect's Office. Must be experienced in construction and detail work. State qualifications and salary required to Box 135, Contract Record, Toronto. 7-8

POSITION WANTED—Civil Engineering Graduate, with experience covering draughting, instrument man, concrete inspection, cost and timekeeping, desires position with engineering or contracting concern. Excellent references. Box 124, Contract Record, Toronto. 6-7

Another New Pump

If all the various kinds of pumps were placed end to end they would probably reach round the world and back again. Nevertheless, British inventive skill continues to produce new forms, for each of which some advantage is claimed in one direction or another. The latest type is particularly adapted to the pumping of heavy fuel oil. It is a development from the ordinary gear pump which is frequently used for small lubricating work or other cases where a little quantity of liquid has to be dealt with. In the ordinary type two plain gear wheels run together, but in the new type one wheel has internal teeth while the other, which runs inside it, has external teeth. This gives a very much more compact arrangement. A pump of this type with a 1½-inch delivery pipe will deliver fifty gallons of heavy oil per minute when running at four hundred revolutions per minute. The efficiency in this case is 60 per cent. This pump is made in several standard sizes, ranging from ½-inch to 3-inch delivery and arranged either for belt driving or direct coupling to a motor.

Testing Bridges

A simple and easily applied apparatus has been devised by a British central station engineer for testing the strain on portions of bridges. It consists of two light hollow spars about 4 feet long, various metal clamps and clips, and a dial reading to one-thousandth part of an inch. When applied to, say, a bar of a bridge the two bars are a ranged in line with the outer ends clamped to the bar at points eight feet apart. The inner ends of the spars are clamped in a particular way in connection with the indicator, so that when the bar is extended or compressed as a load passes over the bridge the total strain is recorded on the dial. This instrument was recently tested with great success on a large British railway bridge.

"Booster" Helps on Grades

A new appliance has been attached to an engine of the Grand Trunk Railway which is known as a "Booster." This new appliance is to replace the trailer wheels under the cab and is said to increase the speed of the locomotive approximately ten miles per hour on certain grades. It is also claimed that in case of one of the driving rods on the main driving wheels of the locomotive being broken this appliance has sufficient power to take the engine into a station under her own steam.

The appliance is run by a power plant of its own and independent of the running gear of the locomotive itself. It is situated under the cab of the engine and replaces the trailer wheels which were previously a drag on the engine.

Algeria Plans Public Works

Algerian financial delegations recently summarized the various phases of public works and improvements to be undertaken in the colony as a result of a loan authorized but not negotiated by a French law of July 23, 1921. This law permits Algeria to borrow up to 1,600,000,000 francs for public undertakings among which are the following: Labor and material for railroads; opening of new vehicle roads; improvements of ports of commerce; irrigation; construction of school buildings, including technical and professional schools; creation and improvement of centres of colonization; development of postal, telegraph, and telephone systems, which are all under French Government control and operation; erection of forest stations and reforestation, and improvement of system of dispensing aid to the poor, especialy among natives in interior districts.

costing $1[illegible],000. [illegible] & [illegible], Vancouver, architects.

Prince Albert, Sask.

Equipment for the addition to the Holy Family Hospital will be purchased by owners. J. Daisley, Prince Albert, has the plumbing contract.

Regina, Sask.

An apartment block costing $100,000 is contemplated by Henry Black, 16th Ave.

St. Lambert, Que.

Plans are being revised and tenders will be called shortly for a factory for Liberty Tire & Rubber Co., St. James St. A. Gdavel, St. Dominique St., architect.

Toronto, Ont.

An $150,000 apartment house contemplated by C. Dunn, Gerrard St. E. Architect has not yet been appointed. Work may commence in April.

Residence in Moore Park costing $10,000 contemplated by C. Dunn, Gerrard St. E. P. L. Davis is the architect.

Two residences costing $12,000 contemplated by Grimshaw Bros., Danforth Ave. P. L. Davis, Gerrard St., architect. Separate trades will be let by the owner.

Waterloo, Ont.

Doer Electric So., King St. W., has the contract for wiring the $101,000 Public School. Reitzel Bros. have the general contract.

THIS COMPANY has been writing Bonds for contractors over a period of eighteen years, and is naturally in a position to properly look after your requirements. Our knowledge of rates and proper rebates to be allowed is at your service. Information of Contracts awarded o to be awarded gladly given on request.

TRY OUR SERVICE
Phone Main 3476

FIDELITY AGENCY
OF CANADA
[illegible]

Big Bridge Completed

The single truss bridge spanning the Tanana river, Alaska, said to be the second largest structure of its kind on American territory, was completed concluding the construction of the main line of the government-owned Alaska railroad, according to Col. Frederick Mears, railroad commissioner of Alaska. The road with its branches taps the interior of Alaska.

The entire railroad project, interrupted by the war, has cost $56,000,000, Col. Mears said. The bridge is 700 feet long. The only single truss bridge that is larger, the commissioner said, is the McKinley bridge across the Mississippi river at St. Louis.

Railways Heavy Consumers

Railroads took about 22 per cent. of all of rolled steel manufactured in the United States in 1922, according to a survey made by The Iron Age and published in its annual number. Buildings and other construction took 15 per cent.; automobiles, 10 per cent.; oil, gas, water and mining, 10 per cent.; agriculture, 4 per cent.; food containers, 4 per cent.; exports, 7 per cent.; and all other uses a total of 28 per cent.

Sources of demand in 1922 were somewhat different than in other years. For example, shipbuilding took less than 1 per cent. of the rolled steel produced, while agricultural consumption at 4 per cent. and exports at 7 per cent. were lower than is normally expected.

Production of Roofing Iron in Russia

The necessity of reestablishing contact with the small consumers and a shortage of financial resources made it imperative for the steel mills of Russia to specialize in the production of the kinds of steel goods commanding broad demand and insuring quick turnover.

In reviving of commodity markets the metallurgical industries found themselves in the most deplorable position, due to the particularly shrunken demand for their products. As a consequence, the rolling mills have started concentrating production on such classes of materials only as find a ready market with the small consumer. Roofing iron belongs to this class and therefore its output progressed considerably in 1922. [Roofing iron is practically synonymous with sheet iron in Russia, since sheet iron is used almost exclusively for that purpose, either flat or corrugated.]

During the first six months of 1922 the production of roofing iron amounted to 18,630 tons, against 8,460 tons during the like period of 1921, and 10,000 tons during the second half of the same year. Comparing this rate of production of roofing iron with pre-war output the figures for 1921 represent only 4.5 per cent of the production of 1913; and even on the basis of the doubled rate of production for the first half of 1922 the total output for this year may be assumed at 9.1 per cent of 1913. The production of roofing iron in the Ural mills (whose product was considered of the highest quality in Russia, due to the purity of the Ural magnetic ore and the rust-resisting qualities of the charcoal-iron base) dropped from 60 per cent of the total production of the country before the war to about 30 per cent; the southern mills have taken the lead, with 50 per cent; the mills of the center produced the remaining 20 per cent.

Stone Measure

Owing to the variety of uses to which stone is put there is no regular unit of measurement employed by the quarrymen, the stone being sold by the cubic yard, cubic foot, ton, cord, perch, rod, square foot, square yard, square, etc. Building and monumental stone, especially the dressed product, is usually sold by the cubic foot or the cubic yard, although this unit varies with the class of stone and with the locality; a large quantity of rough stone is sold by the perch, cord or ton.

Rubble and riprap, including stone for such heavy masonry as breakwater and jetty work, are generally sold by the cord or ton. Fluxing stone and stone for chemical use—as for alkali works, sugar factories, carbonic acid plants and paper mills—are sold by the long ton. Flagstone and curbstone are sold by the square yard or the square foot, the thickness being variable and dependent on the orders received. Granite paving blocks are sold invariably by number, but the blocks are not of uniform size, the value depending on the size of the block and the labor necessary to cut into the shape desired. Other paving material is sold by various units, such as ton or cubic yard.

Crushed stone is usually sold by the cubic yard or ton, the short ton being more generally used. The weight of a cubic yard of crushed stone varies from 2,300 to 3,000 pounds, the average weight being about 2,500 pounds. In certain localities crushed stone is sold by the "square" of 100 square feet by 1 foot, or 100 cubic feet. Crushed stone is also sold by the bushel, 21½ bushels representing a cubic yard of about 2,700 pounds.

WE WILL BOND YOU

Credit for you

Using our Guaranty Bonds on your tenders means a direct addition to your credit at comparatively insignificant cost.

Resources over - - - $31,790,000
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112 St. James St.
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RAIL CARBON

REAL STRENGTH

·HAMILTON·ONT·

"THE·FRAYED·THREAD"

STEEL MANUFACTURERS ALL HAVE A BUG-A-BOO,— A SKELETON IN THEIR CLOSET CALLED "PIPED STEEL".

WITH ALL THE REFINEMENTS IN MODERN STEEL MAKING, IT HAS NEVER BEEN FOUND POSSIBLE TO ELIMINATE PIPING ENTIRELY, AND IN EVERY FORM OF STEEL WORK ITS PRESENCE IS ALWAYS TO BE FEARED.

WE HAVE ALREADY EMPHASIZED THE FACT THAT RAIL-CARBON STEEL IS SUBJECTED IN ITS PRIMARY MANUFACTURE TO A VERY SEVERE INSPECTION TO GUARD AGAINST PIPING. THE INGOT FROM WHICH THE RAIL IS ROLLED IS CUT THROUGH HORIZONTALLY, AND THE TOP PORTION CONTAINING THE PIPING IS DISCARDED.

SUFFICIENT OF THE INGOT MUST BE DISCARDED SO THAT NO EVIDENCE WHATEVER OF PIPING WILL APPEAR IN THE BOTTOM PORTION RETAINED.

IN THE MANUFACTURE OF HEAVY ORDNANCE, THE INSPECTION GOES EVEN FURTHER, AND TO MAKE DOUBLY SURE ON THIS POINT, IT IS LAID DOWN THAT THE INGOT SHALL BE CUT VERTICALLY THROUGH THE CENTRE TO FIND OUT JUST WHERE THE PIPING STOPS.

A RAIL STANDING ON END IS SIMPLY AN ELONGATED INGOT AND THE FIRST OPERATION IN THE MANUFACTURE OF RAIL-CARBON BARS, IS TO SLIT THE RAIL FROM END TO END IN TWO PLACES.

THIS AT ONCE EXPOSES ON THE SURFACE ANY PIPING THAT MIGHT HAVE CREPT PAST PREVIOUS INSPECTIONS, AND THE DEFECT AT ONCE BECOMES VISIBLE, AND THE MATERIAL CONSEQUENTLY IS REJECTED.

IF IT WERE NOT REJECTED THE DEFECTIVE MATERIAL WOULD JAM IN THE ROLLS AND CAUSE A SERIOUS DELAY.

JUST AS A FRAYED THREAD CANNOT PASS THROUGH THE EYE OF A NEEDLE NEITHER CAN A PIPED RAIL PASS THROUGH OUR ROLLS

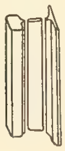
IN OTHER WORDS, THE PRESENCE OF "PIPING" WITHIN THE THICKNESS OF A RAIL-CARBON BAR, IS JUST AS IMPROBABLE AS ITS PRESENCE IN THE STEEL OF THE "QUEEN ELIZABETH'S" 15 INCH GUNS.

THIS IS JUST ONE MORE REASON WHY RAIL-CARBON BARS ARE THE STRONGEST AND MOST RELIABLE ON THE MARKET TODAY.

·THE·INGOT·

·THE·BLOOM·

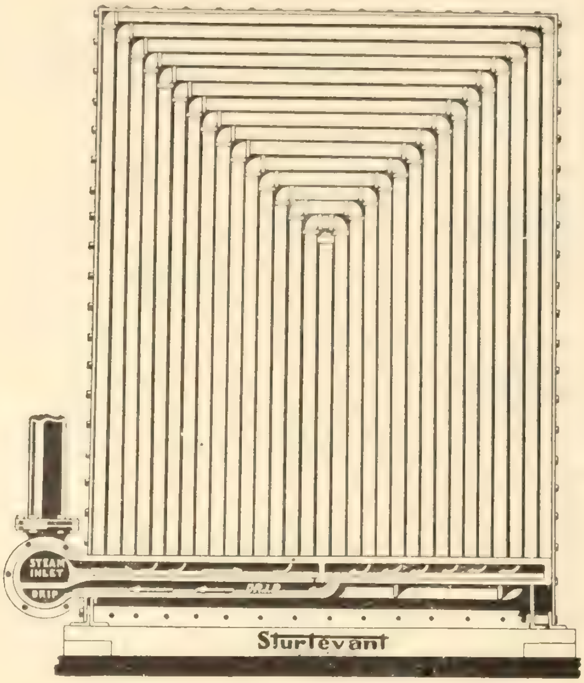
·THE·RAIL·



·THE·SLIT·RAIL·

SPECIFY RAIL-CARBON FOR REAL STRENGTH

·BULLETIN ·No 8–4½ ·BILLION · VIBRATIONS.·



Your Heating and Ventilating Questions Answered

Sturtevant Sales-Engineers have compiled in Catalog 230 specific plans for economical building operation. They include heating and ventilating systems which increase efficiency, speed production and cut operation costs.

Folder 606 outlines the advantages of Sturtevant installations to building owners. It quotes specific savings. Send for it today.

B. F. Sturtevant Company
of Canada, Limited
Montreal - Galt - Toronto

Sturtevant
PUTS AIR TO WORK

Cement Production Down

Production of Portland cement in United States for November was 11,349,0 barrels, compared with 12,287,000 for October, a decrease of 938,000 barrels and the lowest since June, when output was 11,245,000 barrels. Production for eleven months ended November 30 was 105,199,000 barrels, 6,906,000 barrels in excess of output for the entire previous year, and 5,175,755 barrels above 192 the previous banner year.

Shipments fell of 2,687,000 barrels from previous month, being 10,167, barrels, against 12,854,000 barrels in October. November shipments were the lowest since April, when they were 8,592,000 barrels, and compared with the high of 14,361,000 barrels in August. Since January 1, shipments have totaled 111,705,000 barrels, or 6,506,000 barrels above production, and 20,351,000 barrels more than in the corresponding period of 1921.

Standardizing Paving Brick

Excellent illustrations of the opportunity for simplified practice are found in the work already done by several industries. The National Paving Brick Manufacturers' Association realized the need for simplifying the number of sizes of paving bricks. They estimated that there were about 30 sizes and varieties. After a preliminary conference they undertook an exact survey of the field and found that instead of 30 there were 66 sizes and varieties of paving brick actually being manufactured and sold.

As a result of this survey a conference of the manufacturers, municipal engineers, and various associations in the ceramic industry, representing engineers, architects, and buyers, as well as the manufacturers of bricks was called. In a one-day meeting, 30 representatives of organizations reduced the sizes and styles of paving brick by mutual consent from 66 to 11, and recommended that these sizes be adopted by their various associations and groups as recognized sizes in the paving-brick industry. At a later conference of the standing committee, appointed by the first conference, a further reduction from 11 to 7 was effected.

Supplies Wanted by Siam Railways

The Siam State Railways are calling for tenders on January 31, 1923, at noon, for a stock of supply materials, including more than a thousand items, consisting of such articles as chemicals, augers, belting, steel bars, bolts, nuts, screws, drills, brushes, copper pipe, emery wheels, files, gauge glasses, glass, hinges, hose, pipe fittings, rivets, etc. Copy of specification may be seen in the New York district office, 734 Customhouse.

Construction Work in Kenya

Because a saving has been effected in the construction of the Uasin Gishu Railway, the Colonial Secretary has arranged to have these funds diverted for the construction, among other things, of a cold-storage plant and a grain elevator, both to be erected at Kilindini Harbor, in the Colony of Kenya. The cost of the former will be £25,000, while the latter will be erecter at a cost of £100,000. American manufacturers interested in this project should get in contact with the British Colonial Office through their London representative.

MONTREAL'S NEW HOTEL—

With its 10 towering stories, its 1046 guest rooms—each with private bath—its banquet halls and ball rooms, Mount Royal Hotel is one of the largest and finest hotels on the American continent.

There's not a city in the world that wouldn't be proud of such a hotel.

There's not a roofing manufacturer in the world who wouldn't be proud to have his materials selected for such a hotel.

As would naturally be expected, this magnificent structure is covered with a Barrett Specification Bonded Roof—the only roof that is guaranteed against maintenance expense by the bond of a Surety Company.

Barrett Specification 10 year Bonded Roof on Mount Royal Hotel, Montreal. Owners: Mount Royal Hotel Co., Ltd., Arch. Ross & Macdonald, Montreal; Gen. Cont. The Thompson Starrett Co., Ltd., Montreal; Roofer The Carmichael Waterproofing Co., Toronto.

The Meaning of the Surety Bond

The Bond which guarantees the Barrett Specification Bonded Roof is issued at the expense of The Barrett Company, Ltd., by the Montreal Branch of the U. S. Fidelity & Guaranty Company of Baltimore—one of the strongest surety companies in North America.

To the owner of the building this bond means absolute freedom from roof repair and maintenance expense during the 20 or 10 year bonded period.

To the architect of the building this bond means that the roof will be exactly as specified—that the necessary number of layers of Specification Roofing Pitch and Specification Felt, with a thick wearing surface of gravel or slag will be applied, and that the roof will be constructed by a competent contractor under the watchful eye of an experienced Barrett Inspector.

To the roofing contractor, this bond means an honest basis for estimating his costs. It removes the competition of roofers who, by skimping materials and workmanship, can under-bid the reputable contractor whose first consideration is the quality of his work.

There are two types of Barrett Specification Bonded Roofs—Type AA bonded for 20 years, and Type A, bonded for ten years.

We will gladly send, on request to our nearest office, full information regarding these bonded roofs and copies of the Barrett Specifications.

WINNIPEG VANCOUVER
HALIFAX, N. S.

The Barrett Company
LIMITED

MONTREAL TORONTO
ST. JOHN, N. B.

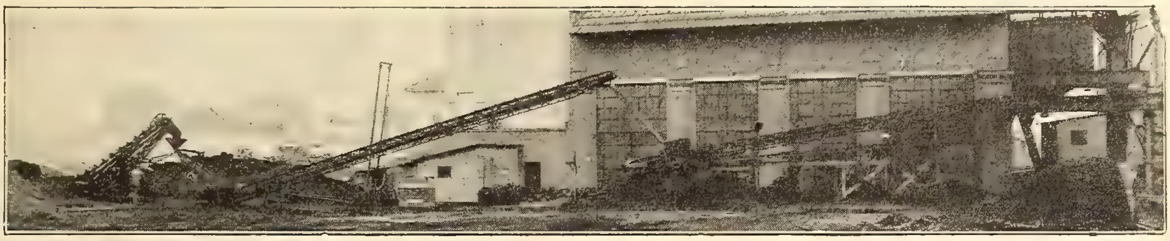
Barrett Specification Roofs
Bonded for 20 and 10 Years

Current Prices of Building and Engineering Materials

CEMENT (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Retail lots including bags	per bbl.	$4.60	$4.40	$4.80	$3.70
Car lots, including bags	per bbl.	3.35	3.68	4.16	3.35
Refund on bags	each	.20	.20	.20	
LIME (Delivered on job):—					
Lump, in retail lots	per ton	14.30	14.00	.58 bu.	2.70 bbl
Lump, in car lots	per ton	12.70**	11.00	13.80 ton*	2.60 bbl
Hydrated, in retail lots	per ton	20.00	26.00	.60 bag*	30.00
Hydrated, in car lots	per ton	19.00	21.00	.54 bag*†	25.00
BRICK and TILE (Delivered on job):—					
Common face brick	per M.	24.00	16.00*	19.00	30.00
No. 1 dry pressed brick	per M.	31.00	30.00	36.00	70.00
No. 2 dry pressed brick	per M.	29.00	25.00	32.00	
Enamelled brick	per M.	125 up to	230.00	185.00	150.00
Wire cut brick, for foundation work	per M.	21.00	19.00		50.00
Sand lime brick	per M.	17.00		18.00	
Hollow building tile	per M.			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	60-95	60-75	85-100	80.00
Fire clay	per ton	13-20	15-16.00	35.00**	22.00
STONE, SAND and GRAVEL (f.o.b. cars on siding):—					
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.00 yd.
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 "	" "
Crusher run	per ton	2.20½		3.00 "	" "
Rubble stone	per ton	2.45	1.70	15.00 cord	" "
Gravel, 2 in. screened	per ton	2.05		2.45 yd.	" "
Gravel 1 in. screened	per ton	2.31	1.50	2.75 "	" "
Sand, screened	per ton	1.42½	1.25	1.90 "	" "
Pit run	per ton	1.52¾	1.25	1.90 "	" "
STEEL and IRON (f.o.b. warehouse):—					
Mild steel bars, ¼ in. and heavier	per 100 lbs.	3.25 base	3.25 base	4.35	$4.00
Bands 3/16 in. and lighter	per 100 lbs.	3.75 "	3.25 "	4.85 base	
Hoops	per 100 lbs.	4.50 "	4.25 "		
Twisted and deformed bars	per 100 lbs.	3.35 "	3.25 "	4.20	4.00
Angles, channels and tees under 3 in.	per 100 lbs.	3.35 "	3.75 "	4.95	6.00
Structural shapes	per 100 lbs.	3.60 "	3.75 "	4.75	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.25 "	3.50 "	4.75	6.25
Plates—3/16 in.	per 100 lbs.	3.60 "	3.85 "	5.15	6.50
Plates—10 gauge	per 100 lbs.	4.15 "	4.00 "	5.45	6.50
Black sheets—28 gauge	per 100 lbs.	5.00 "	4.50 "	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.20 "	6.00 "	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	6.20 "	6.50 "	7.70	8.25-8.50
Rivets	per 100 lbs.	5.75 "	5.50 "	7.00 base	
Cast iron pipe	per ton	60.00	55.00		
VITRIFIED CLAY PRODUCTS (Delivered on job):—					
Sewer pipe, 4 in.	per ft.	.40	.30	.35	.28
Sewer pipe, 6 in	per ft.	.60	.45	.45	.48
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.55
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.70
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.85
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00	.90	.65	.75
Chimney tops	each	9.00	3.50–5.00	7.50	4.50–6.00
Discounts		45 % truck lots 50 % car lots	20 % 50 %	5 %	

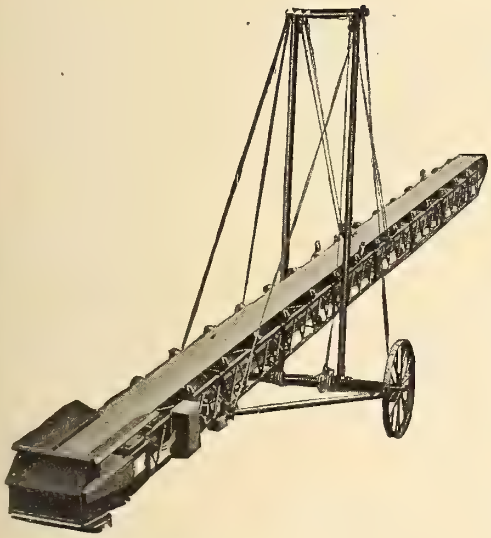
CEMENT:—*Discount of 10 cts. per bbl. in 20 days. Price f.o.b. cars is $8.75 †Subject to 5% discount. **Excluding bags.
LIME:—*Discount of 5%. †Bag of 50 lbs. **Price f.o.b. cars is $11.70.
BRICK AND TILE—*f.o.b. plant.
STONE SAND AND GRAVEL:—*Winnipeg prices subject to 5% disco **Toronto prices include sales tax.

THEY WORK TOGETHER



BARBER-GREENE

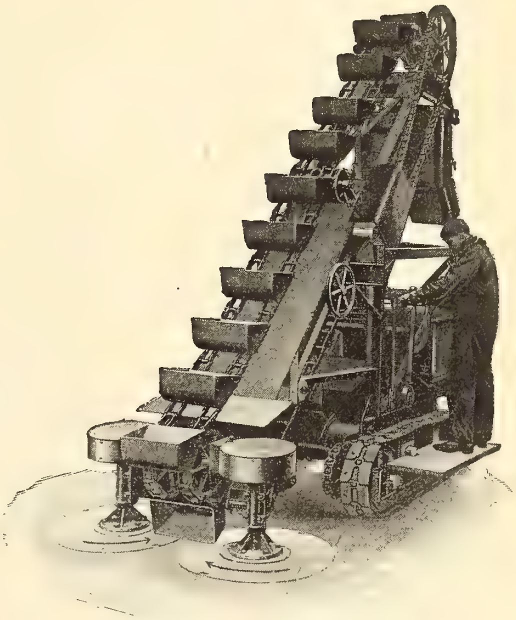
PORTABLE BELT CONVEYORS
and
BUCKET LOADERS



MAKE YOUR HANDLING PROBLEMS EASY

The Barber-Greene Loader with the revolving discs will load from bank or stock pile at the rate of 75 yds. per hour.

Send for particulars



Complete Assortment of Equipment and Supplies for Contractors, Mines, Quarries, etc, etc

We can furnish you with a Hammer or a Steam Shovel

MUSSENS LIMITED

Montreal Toronto Winnipeg Vancouver

CURRENT PRICES OF BUILDING AND ENGINEERING MATERIALS— continued

Lumber (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver*
Flooring, 1 x 3 and 4 in., clear, E. G. fir	per M.	100.00	60.00	84.00	55.00
Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	75.00	65.00	56.00	30.00
Flooring, No. 1 pine	per M.	70.00	80.00	64.80	
Flooring, No. 1 Spruce	per M.	45.00	40.00	39.60	
Flooring, birch and maple, 13/16 in. clear	per M.	130.00	110.00	152.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	130.00	125.00	140.00	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	75.00	60.00	56.00	30.00
V joint, No. 1 pine	per M.	70.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	43–58	45.00	63.75	
Pine, 2 x 4 to 12 in., common rough	per M.	50/55	70.00	36.00	
Hemlock, 2 x 4 to 12 in.	per M.	40-42.00	40.00	36.00	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	40–50.00	50.00	36.00	11.00-13.50
Spruce, 1 and 2 x 4 to 12 in.	per M.	41/46	45–35	36.00	
Timbers, fir, 10 x 10 in. and up	per M.	65.00	58.00	47.00 base	17.-22.00
Lath, No. 1 white pine	per M.	14.00	12.00	12.00	
Lath, M. R. spruce	per M.	10.00	8.50	10.00	7.00
Shingles, XXX B.C. cedar	per M.	6.35	5.00	5.25	3.40
XX B.C. cedar	per M.	5.00	4.25	3.75	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	108.00	55.00
Fir casing	per M.	1 ct. per in.	100.00	108.00	
PAINTS, OILS, COLOURS (delivered):—					
White lead ground in oil, less than ton lots	per cwt.	14.55	13.35	14.85	15.80
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	22.00
Putty in bulk	per cwt.	6.70	3.75	5.50	9.25
Steel sash putty in bulk	per cwt.	7.20	6.00	8.75	7.75
Boiled linseed oil, in bbls.	per gal.	1.15	1.04	1.13	1.28
Raw linseed oil, in bbls.	per gal.	1.18	1.02	1.10	.1.25
Turpentine, in bbls.	per gal.	2.25	1.95	2.15	1.60
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 4/5	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 1/5	.45
PLASTER (Delivered):—					
Hard wall plaster, sanded	per ton	13.50	15.00	25.00	30.00
Plaster of paris, in bbl. lots	per bbl.	6.00	5.35	1.60 bag*	7.50
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu.	1.50
LABOR:—					
Bricklayers	per hr.	1.00	.80–.90	1.15	1.06¼
Structural Iron Workers	per hr.	.85	.50–.75	1.25	1.00
Plasterers	per hr.	1.00	.80	1.05	1.06¼
Hoisting Engineers	per hr.	.70–.80	.50	.90–1.10	1.00
Plumbers	per hr.	.90	.60–.75	1.00	.90
Carpenters	per hr.	.80	.65	.90	.81¼
Painters	per hr.	.75	.55–.65	.80	.81¼
Electrical Workers	per hr.	.80	.65	.70– .90	1.00
Roofers	per hr.	.65	.65		.90
Laborers	per hr.	.40–.50	.30	47½–.55	.50–.56¼
Sheet Metal Workers	per hr.	.75			.90

LUMBER:—*Owing to the general unstable condition of the present lumber market, Vancouver dealers refuse to quote any prices at all especially for Prairie or Eastern publication. The prices are, moreover, fluctuating from day to day. Such prices as we quote are, therefore, averages and not standard.

PLASTER *Including bags.

SCREEN GRAVEL
PEA GRAVEL
SAND

Rapid Truck Delivery. Just Phone
Beach 1128 or 1780

ALLEN BROTHERS
STOP 19, KINGSTON ROAD
TORONTO, ONT.

Tested Efficiency and Tested Strength

—*proof that this insulation saves more heat*

A LENGTH of pipe insulation can save more heat in two ways: by its greater efficiency, and by its greater strength which increases its working life.

The greater efficiency of Asbesto-Sponge Felted Insulation has been proved by frequent tests—In a test of 26 insulations at the University of Wisconsin, it showed the highest efficiency.

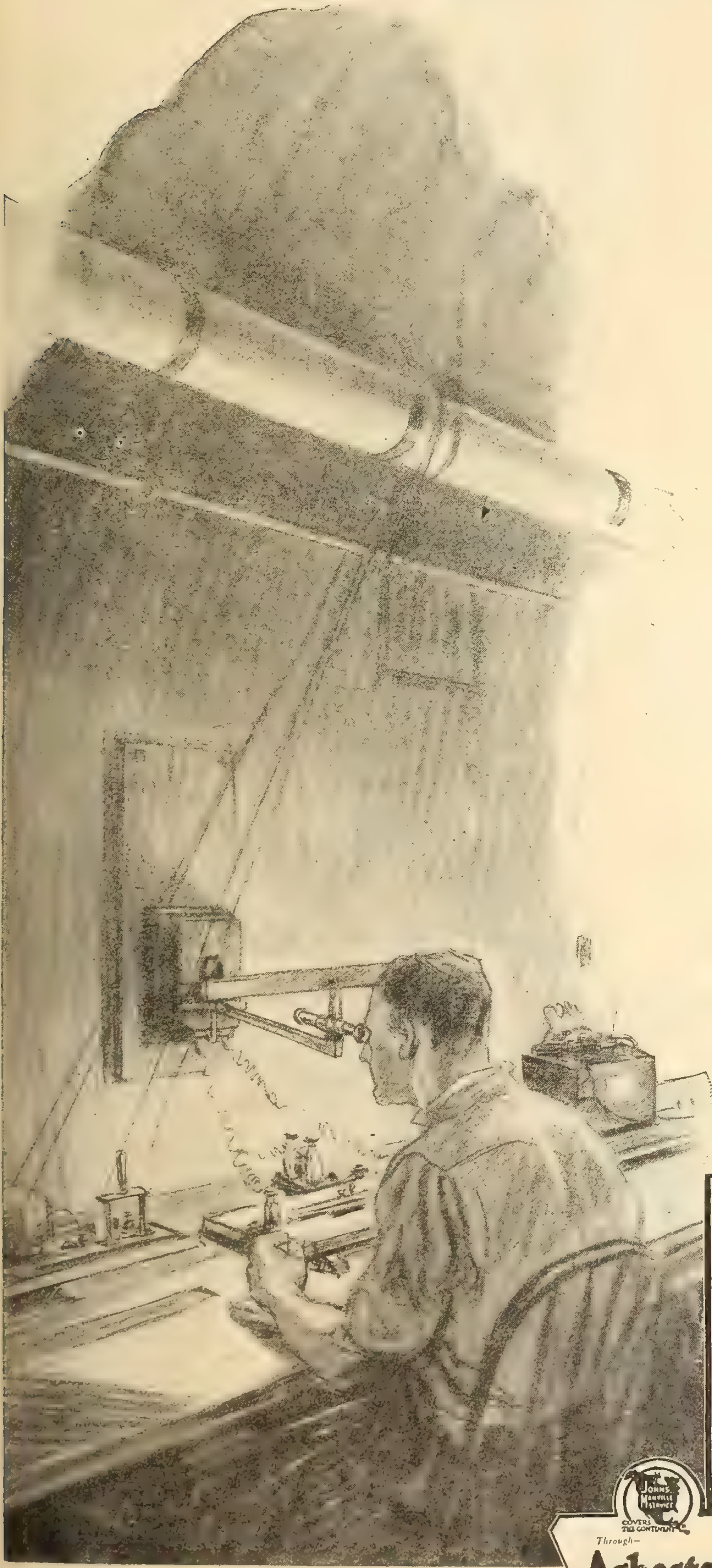
The greater strength of Asbesto-Sponge is obvious—hit it with a hammer or test it in any way you please. It has lasted well over twenty years on hard service—a record that will be exceeded as the passage of time permits.

These tests prove the ability of Asbesto-Sponge Felted Insulation to save more heat in *both* of the ways such saving is possible—higher efficiency and longer life. Naturally, it is more economical.

CANADIAN JOHNS-MANVILLE CO. LIMITED
Toronto Montreal Winnipeg Vancouver
Windsor Ottawa

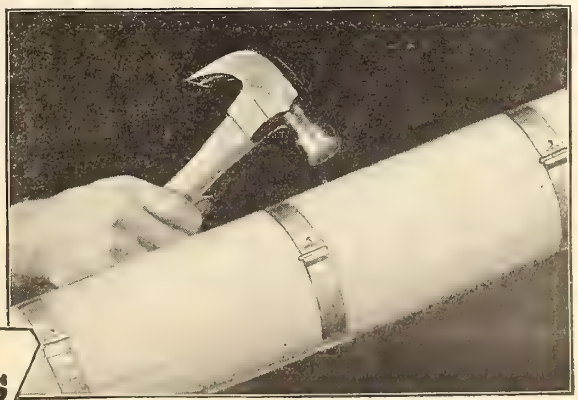
JOHNS-MANVILLE

Power Plant Materials



Testing pipe insulation by the electrical method—an accurate test that has repeatedly demonstrated the greater efficiency of Johns-Manville Asbesto-Sponge Felted Insulation. The electrical heating input necessary to keep the pipe at a given temperature measures the heat loss.

JOHNS-MANVILLE SERVICE
COVERS THE CONTINENT
Through—
Asbestos
and its allied products
INSULATION
BRAKE LININGS
ROOFINGS
PACKINGS
CEMENTS
FIRE PREVENTION PRODUCTS

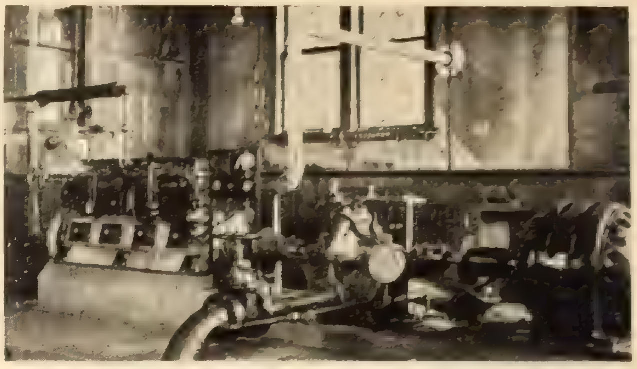


You can hit Asbesto-Sponge Felted Insulation with a hammer—a test that has an important bearing on the life of an insulation in service.

Sterling
THE ENGINE of REFINEMENT
For the finest boats that float

STANDBY!

A steam plant, or an oil engine of equivalent grade of manufacture, averaged at $150 per H.P., costs six times the price of a STERLING. The interest charges alone on the investment, or the difference in the price, would run the STERLING engine in standby service for years.



STERLING 8 cylinder high duty gasoline engine 180 H.P. at 1200 R.P.M. operating an American type D.S. 6" single stage centrifugal, capacity 1000 Imp. G.P.M., 150 ft. head, also a 75 H.P. motor used as a generator when power is down. Set furnished by Gormans Ltd., Calgary, Alta., to Town of McLeod, Alta.

Sterling Engine Co. Department C. 9 **Buffalo, N. Y.**

40 to 300 H.P. at 1200—1500 R. P. M.

"Everything In Sheet Metal"

For Architects, Engineers And Contractors

Use Pedlar's Metal Lath for Fireproof Buildings of every style and size.

Write For Special Catalogs on—

PEDLAR'S
Metal Lath
Rib Fabric
Metal Floortyle
Steelcrete
Culverts
Etc.

With branch offices and warehouses located in the principal centres of population throughout Canada, and a "Million-Dollar Plant" at Oshawa, we are in a position to give you prompt and efficient service.

The PEDLAR PEOPLE Ltd.
(Established 1861)
Executive Offices: Oshawa, Ont.
Factories: Oshawa, Ont., Montreal, Que.
Branches: Montreal, Quebec, Ottawa, Toronto, Hamilton, Winnipeg, Calgary, Vancouver

"What You Want— When You Want It"

The above is the slogan we always live up to.
Your Requirements for

Empire Brand Hardwood Flooring

can be met promptly
In Maple, Birch and Plain or Quarter Cut Oak
WRITE TO-DAY

J. R. Eaton & Sons Limited
ORILLIA ONTARIO

VINCENT'S
Prepared
Tracing Papers

Superior Tracing Papers

"Vellum" No. V-110 Cream Tint, "Vellum" No. V-120 Natural Tint, "Veltex" No. V-140 Blue Tint.

NOT AFFECTED BY WATER OR VARYING ATMOSPHERIC CONDITIONS

and therefore superior to tracing cloth, as drawings to scale remain accurate indefinitely.

INK, PENCIL, CRAYON, OR WATERCOLORS MAY BE USED

Fast, sharp prints by any process.

A heavy, strong, and exceptionally transparent paper

UNEQUALLED FOR ERASING

Does not deteriorate with age and will not become brittle. Supplied in rolls on large diameter cores, so that it will lie flat on the board. Sheets cut to order.

ORDER THROUGH YOUR DEALER

Samples on request from the manufacturer

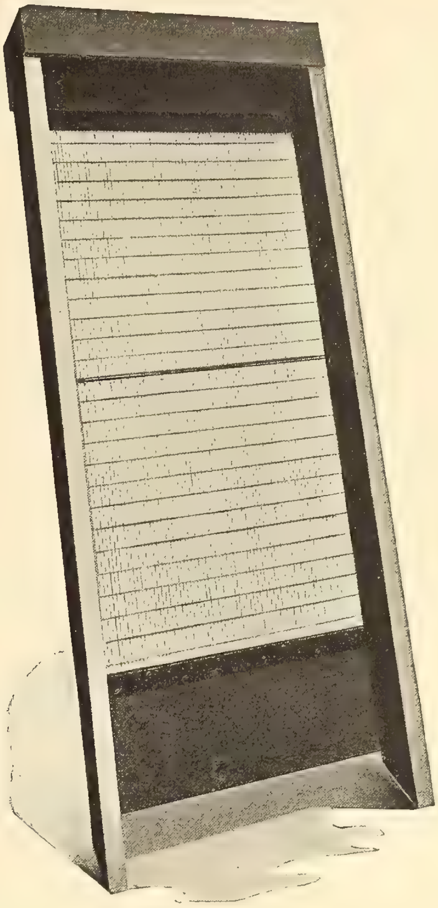
GEORGE VINCENT
49 West 43rd St. NEW YORK CITY

It Pays

to get acquainted with Smart-Turner Quality and Service.

Our watchword is "The Best in Pumps"

The Smart-Turner
Machine Co., Limited
Hamilton - Canada



When in Doubt Consult the Greening Catalog

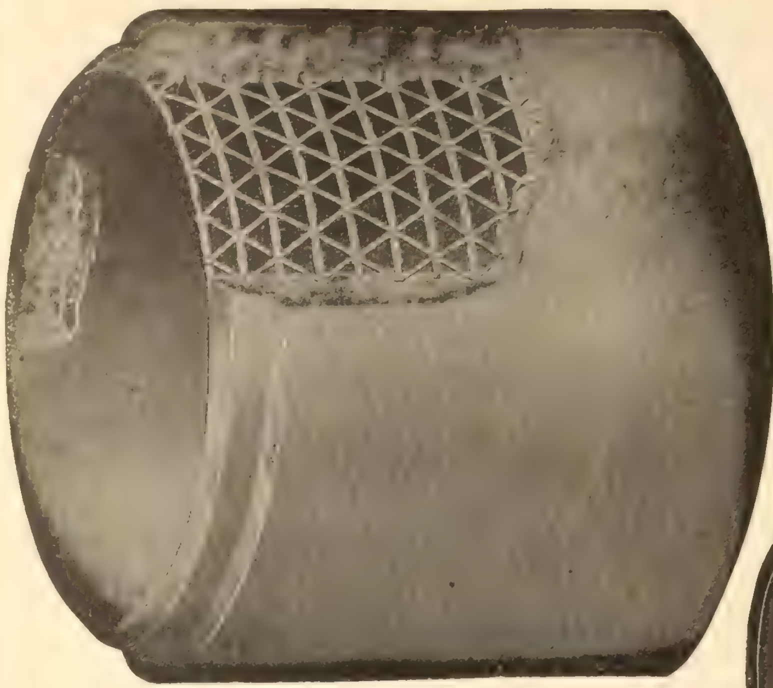
Whenever you want a question answered on wire screen or cloth refer to the Greening catalog. You will find it comprehensive and the illustrations explain many points, such as, size of wire, variety of meshes, crimp, discharge area, etc.

If you require more detailed information remember our data files are always at your disposal. Sixty years experience has gained us valuable information that frequently saves our customers time and money.

Write for our catalog if you have none on file.

WIRE ROPE WIRE CLOTH
PERFORATED METALS
PROTECTIVE SCREENS CHAINS
and allied wire products

THE B. GREENING WIRE CO., LIMITED
Hamilton Ontario
Montreal, Quebec, Winnipeg, Man.
Complete stocks carried at these points



Sewers
and
Culverts
built from
Our Concrete
give maximum service
at minimum cost
(LARGE STOCK ON HAND

Write us for Catalogue and Prices

Dominion Concrete Co. Limited
KEMPTVILLE - ONTARIO

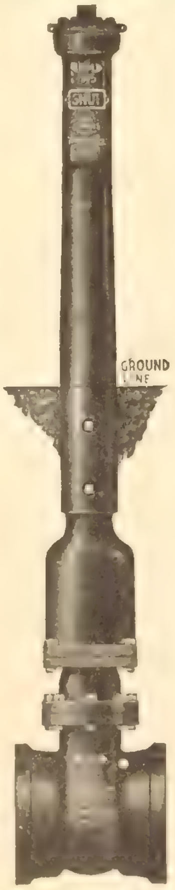


Fig. 845 complete with valve

This Is A
JENKINS INDICATOR POST

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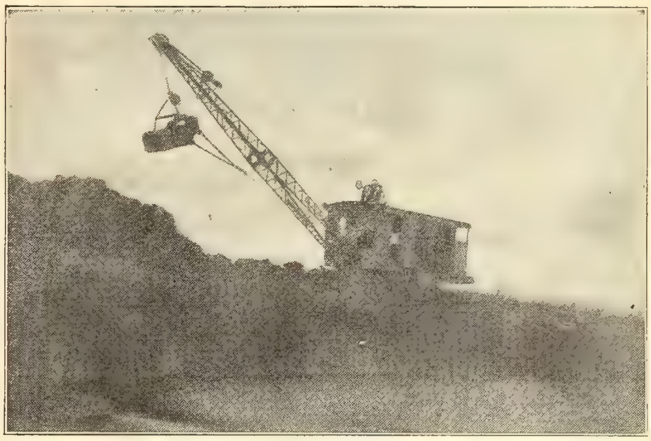

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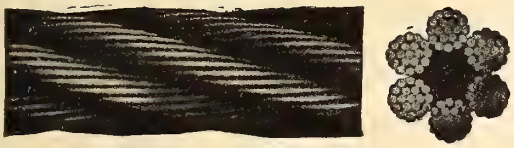

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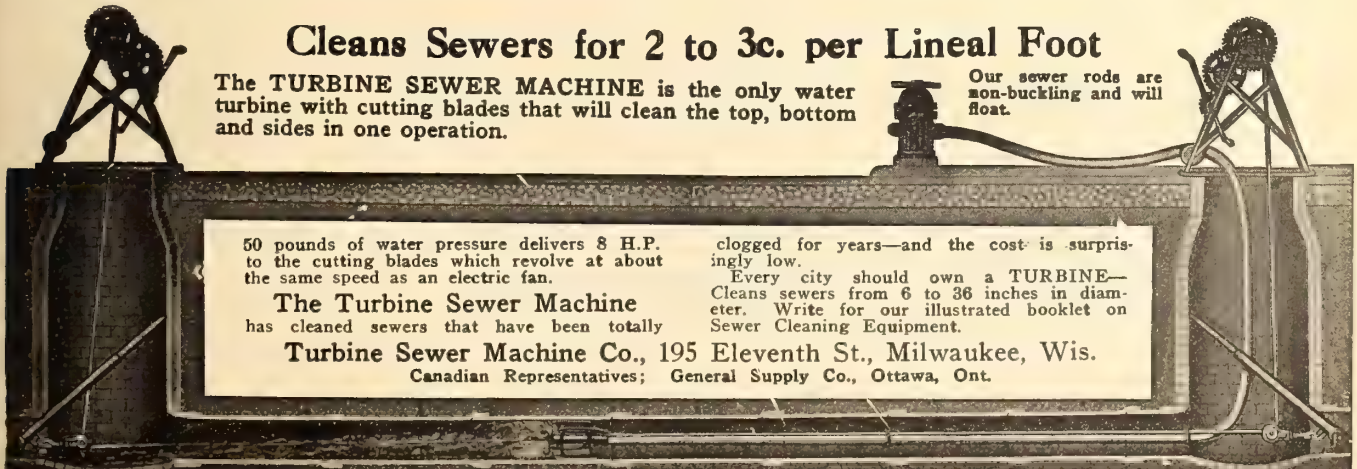

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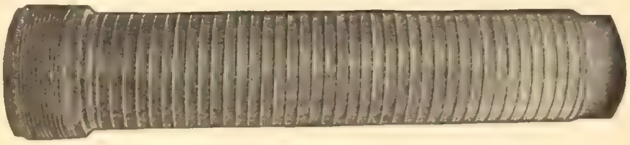

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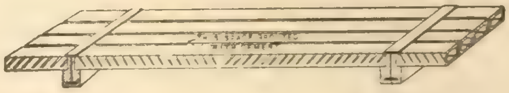

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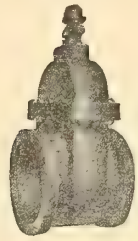

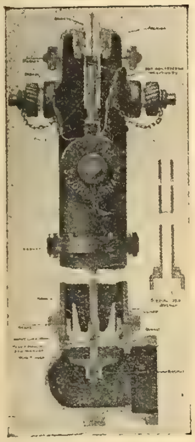

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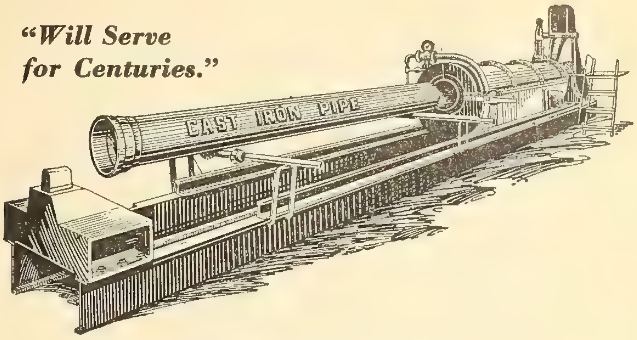

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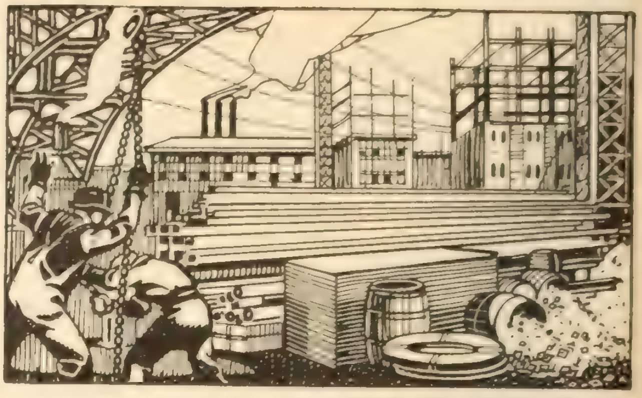

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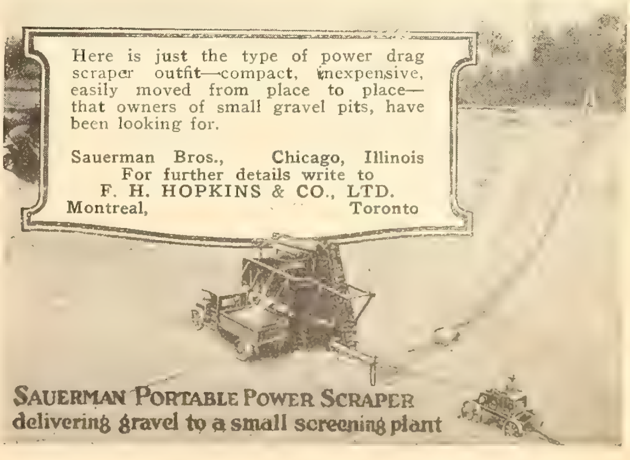

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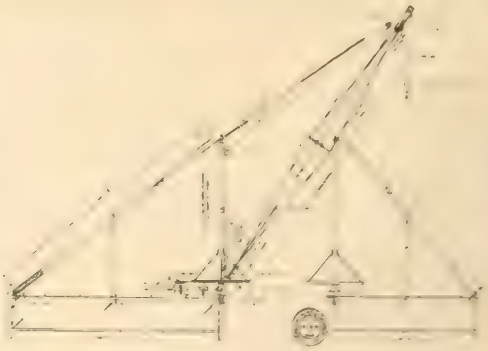

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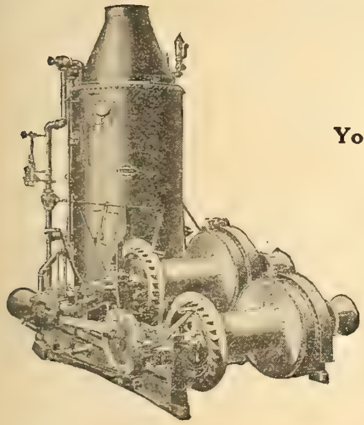

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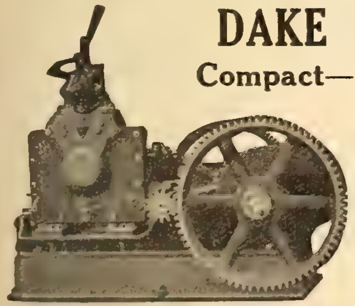

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Building Excavations - Stripping Quarries
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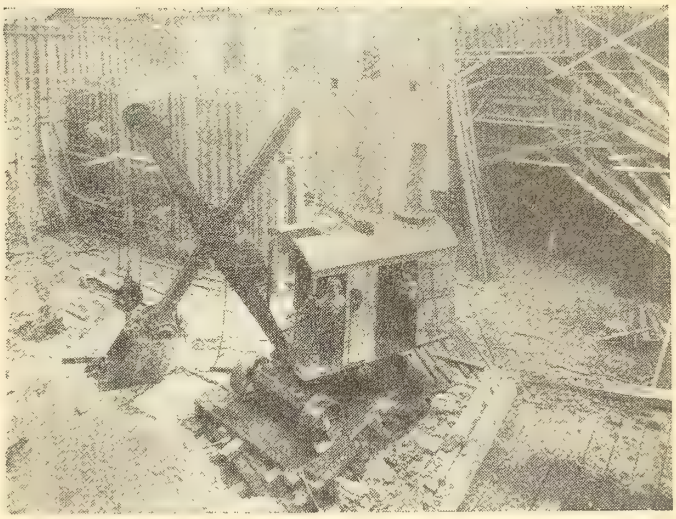
We have successfully handled many of the largest jobs in the Province and in every instance the work has been completed well within the time set and to the satisfaction of all concerned.

Steam Shovels and Dump Body Trucks always available for hire at moderate rates.



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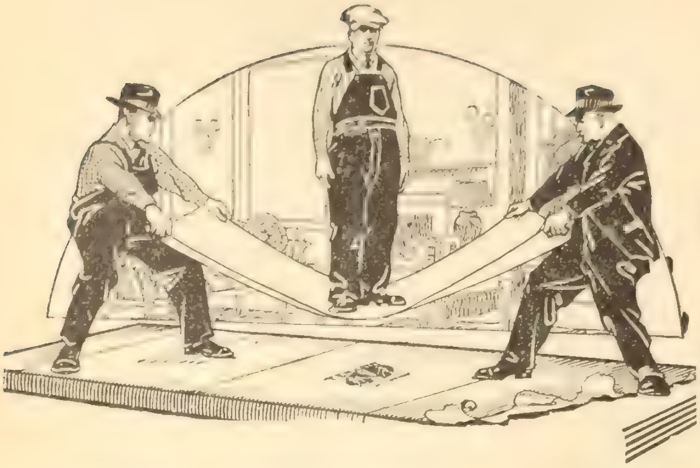

You Know In Advance How This Board Will Stand up—The Tests Are Its Guarantee

What a big advantage it is to be absolutely sure that your walls and ceilings will not crack, crumble, shrink or sag—that they will keep out dampness, heat and cold if built with

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THE BOARD WITH THE 10 TESTED FEATURES
SOLID FIBRE BOARD

You have that assurance because ten of the severest tests a prominent consulting engineer could devise, were made with Ten Test Solid Fibre Board, to prove that it is ideal for exterior or interior walls and ceilings—is weather-proof, cold proof, heat proof, sound proof, fire and moisture resistive can be papered, painted or kalsomined—that it holds stucco to its surface with an everlasting grip—and finally that it is permanent and the most economical building material you can use.

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What Why and How to Build with TEN TEST
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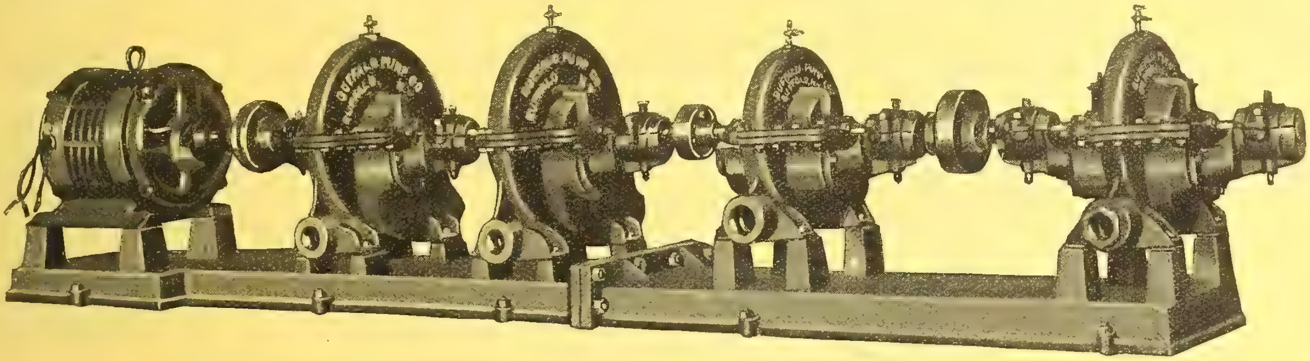
90% Deactivation of Sea Water Greatly Cuts Plumbing Repairs

The Canadian Pumps shown are used by a very prominent seashore hotel in connection with the extraction of oxygen from sea water used in its rooms; and for distributing the sea water to different floors. An immense saving in plumbing maintenance is reported.

The materials used in the pumps insure long and satisfactory service under conditions that quickly destroyed plumbing.

Put your special problems up to our engineers for a non-obligating solution. Cat. No. 12 is ready. Where shall we mail it?



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Build a Road that Resists Bombardment

When the mighty guns on the Western front hurled broadsides of ponderous steel projectiles the turrets and forts, regarded as impregnable, crumpled like cardboard. The result was a resort to earth trenches and embankments. Why? Because the only resistance possible was that of absorbing the shock instead of defying it. The same principle dictates shock absorbers and pneumatic tires for automobiles and trucks to protect the vehicle and its load. Our streets and roads must withstand the bombardment of more than four million truck wheels. The shock absorber in this case is the asphalt wearing course whatever the base. Asphalt,—resilient, dustless, noiseless, waterproof, wearproof,—the pavement of Broadway, Fifth Avenue, Michigan Boulevard, Broad Street, and Pennsylvania Avenue, is the last word in modern pavement design and is no more costly than a rigid unprotected pavement.

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We specialize in the construction of wire rope for every requirement. Years of experience warrant us stating frankly that we offer the best to be obtained.

If you want wire rope that can be absolutely depended upon to give the most economical results, we ask you to specify "Dominion."

We carry a complete stock of all classes and sizes for prompt shipment.

Blocks — Clips — Thimbles — Turnbuckles, Etc.

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Twenty-five (25) one-yard "Ransome" Concrete Mixers

Used by the

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For the Construction of the Chippawa Creek Canal

The very best mixers obtainable were desired to carry on this important work in record time—mixers which were efficient and durable and also which could be depended upon to stand up under extreme conditions and give at all times the results that satisfy.

That is why our "Ransomes" were selected. The desired results were obtained.

Total yardage of concrete on this project was 500,000 cubic yards.

When **you** are considering the purchase of a mixer—will you not let us tell you just what we can promise.

Yes—'tis true—"Ransome" Mixers cost more—but—they're worth it.

We build the best we know—if we could improve them—we would do it.

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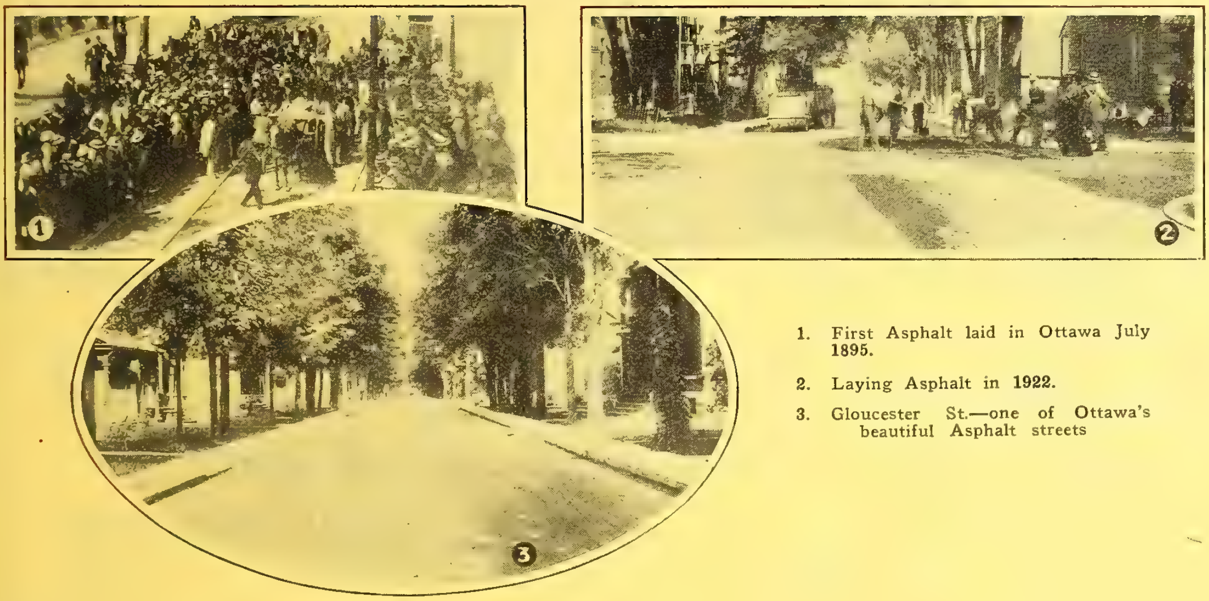
Vol. 37 Toronto, February 21, 1923 No. 8

Contract Record and Engineering Review



1. First Asphalt laid in Ottawa July 1895.
2. Laying Asphalt in 1922.
3. Gloucester St.—one of Ottawa's beautiful Asphalt streets

Ottawa's Asphalt Record

At the close of 1919, 72% of the permanent paving in Ottawa was Asphalt. To date this percentage has been increased to 77% for there are now 973,844 sq. yds. of Asphalt out of 1,256,434 sq. yds. of permanent pavement exclusive of 68,974 sq. yds. of Asphalt repaving. Last year 31,044 sq. yds. were laid which is well up to the average yearly yardage for the past 28 years.

Ottawa laid Asphalt for the first time in July 1895 on Sparks Street opposite the General Post Office. Since then this type has predominated with the result that, as well befits Canada's Capital, Ottawa now enjoys the distinction of having streets which for durability, service and cleanliness are second to none in Canada.

Great credit for the high type of workmanship is due to the officials in charge Mr. A. F. Macallum, Commissioner of Works, Mr. F. C. Askwith, Deputy Engineer and Mr. L. McL. Hunter, Assistant Engineer on Pavements, and to the Corporation Works Department and the local contractors who have so efficiently co-operated in the work of constructing these pavements with Imperial Asphalts.

IMPERIAL Asphalt PRODUCTS

Paving Asphalts
Asphalt Binders
Liquid Asphalts
Asphalt Cold Patch

ROAD ENGINEERING DEPARTMENT
Imperial Oil Limited
Toronto **Canada**

Alphabetical Index to Advertisers Page 16 Classified Directory to Advertisements Page 6

A view of our 36" Continuous Stave

Wood Pipe

in the famous Capilano Pipe Line which, after serving Vancouver City faithfully for over 15 years, is still in its infancy.

C. S. Pipe is used successfully for hydro - electric purposes up to 14 ft. in diameter.

TANKS
and SILOS to Order
Any Size—Any Style

CONTINUOUS STAVE
Wood Pipe
or WIRE WOUND

YOU CAN NO LONGER RECKON WITHOUT WOOD PIPE

We have enthusiastic customers willing to assure you that recent improvements have so increased efficiency and durability as to place **Wood Pipe** on a plane with Cast Iron. These features at a low initial cost, combined with ease of transportation and installation, spell true **Economy.**

When writing for information and prices please specify diameter and pressure

Our Electric-Butt-Welded STEEL DOUBLE COUPLING with Inside Ring Galvanized has entirely eliminated joint leaks and has perfected **WIRE WOUND PIPE**

Canadian Pipe Company, Ltd.

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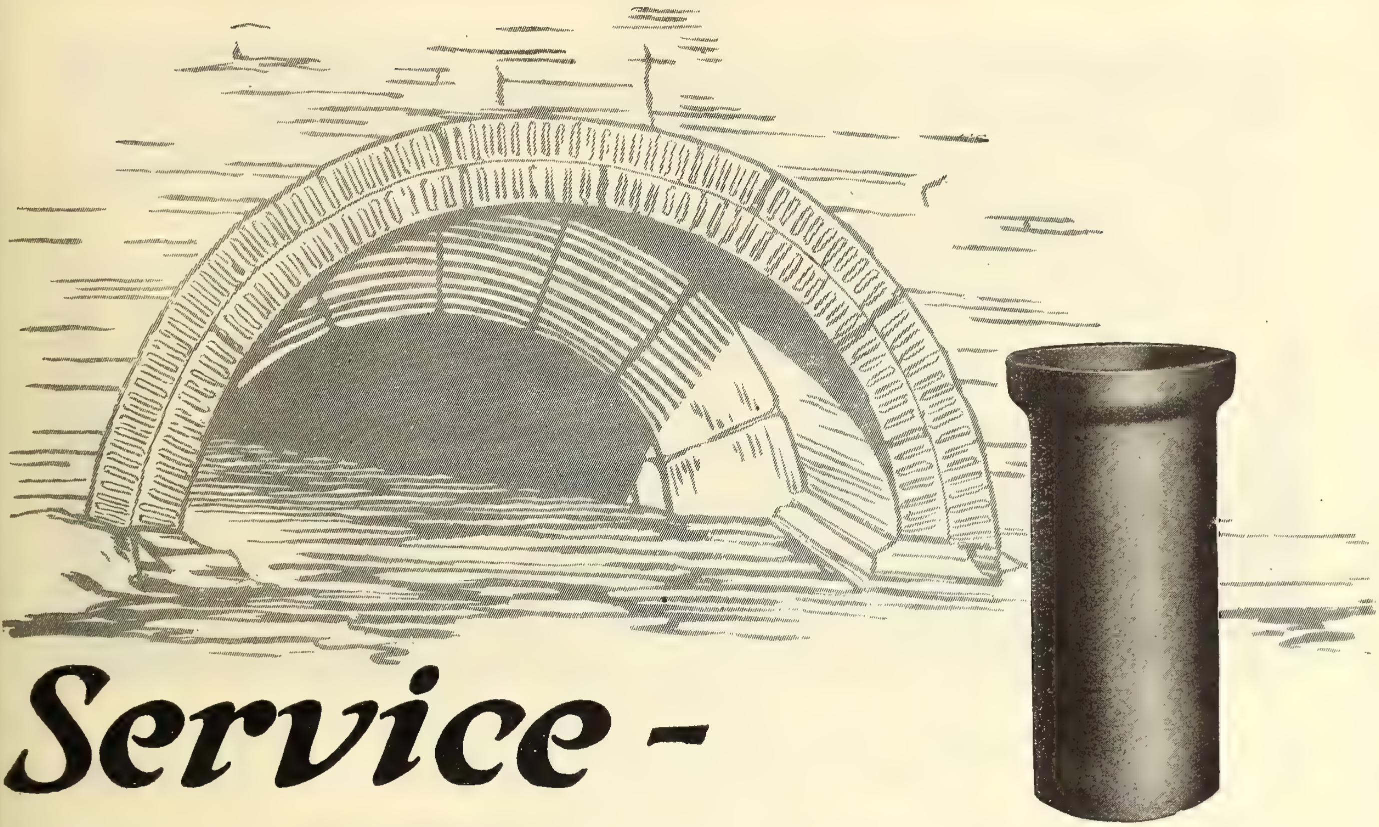

Service -

Efficient and constant service is the first essential of a Sewer system

The Romans realized this and the "Cloaca Maxima" the great sewer of ancient Rome was so splendidly constructed that it has lasted to the present day. One authority has stated that the preservation of the Eternal City is undoubtedly owing to this splendid work, as the adjoining plains have often been swamped.

Modern science has taught the necessity of both proper drainage and sewerage. Vitrified Clay pipes were chosen for the first sanitary sewer systems because of the well known endurance of burnt clay tiles in land drainage.

The potter discovered the art of salt glazing and when this process was adopted by the manufacturer of sewer pipe, endurance and efficiency were greatly increased.

No other material has taken the place of Vitrified Clay Pipe because of superior qualities of endurance or efficiency in service.

If the material is properly laid actual experience has proved that the sewers will give the same constant and efficient service a century hence as the present day.

Specify and use Vitrified Clay Pipe and you will have no cause for any anxiety.

For quotations and particulars write to

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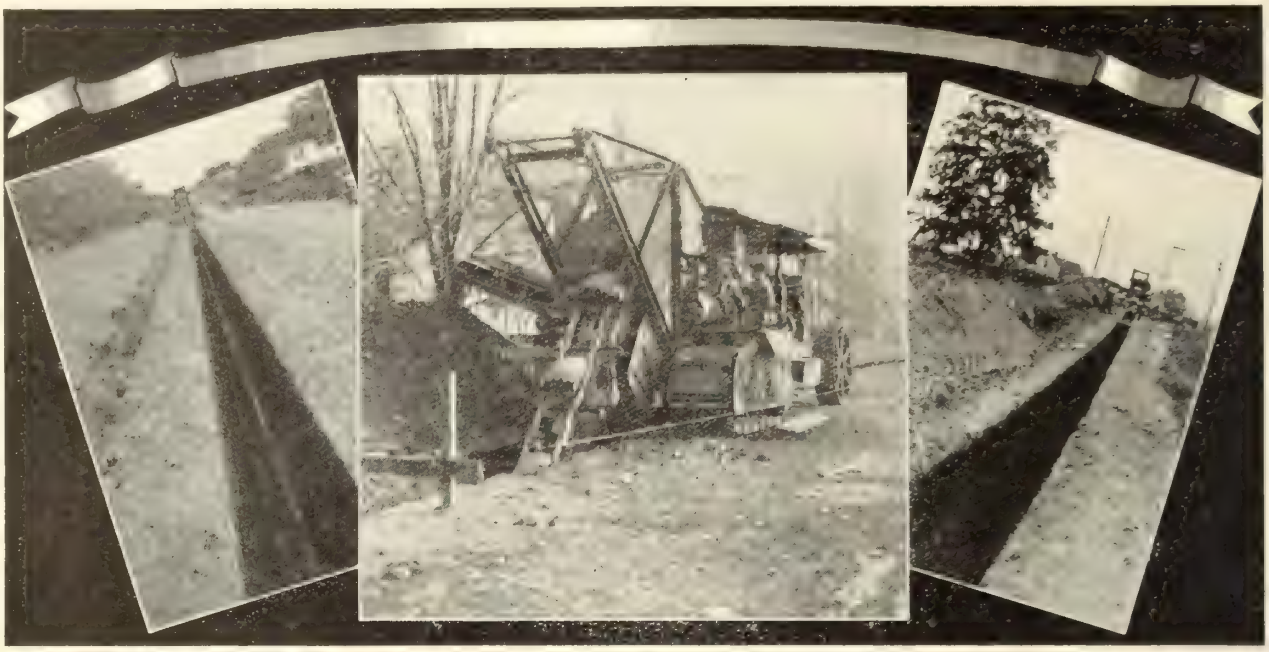
9 Wellington Street East, Toronto

St. Johns, P.Q. **New Glasgow, N.S.**



If They Handed Out Blue Ribbons

for Trench Machine Performance

Blue Ribbons for the winners—the **best** in every way.

If they handed out blue ribbons for trench machine performance Buckeyes would look like a bride's new baby carriage.

For twenty five years Buckeyes have battled in all kinds of soil. They've waged the toughest trench fights and have come through **winners.**

Long service—**steady going—always ready to go.** You just can't beat Buckeyes **—they're tough.**

Get Acquainted With These Buckeye Features

Buckeye Auxiliary Cutter

In no other machine can you get the big cutting range that Buckeye offers.

The new Rotary Auxiliary Cutter so greatly increases Buckeye's cutting range that with one machine a contractor can cut trench of practically any width. The C-10 cuts from 24 to 44 in., C-15 from 24 to 60 in.—C-20 from 40 to 76 in.

Quick Shift Conveyor

Delivery changed **instantly** from one side to the other. This Buckeye feature is invaluable when working in crowded quarters or when trees or poles are close to the trench line. In every way Buckeyes are built to dig big yardage at low cost.

Cost Less to Operate

"After a thorough trial we found a Buckeye cost less to operate—gave better day to day service than any machine made—and we used them all. Repairs and upkeep very low" — McHugh-Cole Co., Lima, Ohio. Buckeyes cost less to operate because they **dig big yardage.**

The Buckeye Traction Ditcher Company, Findlay, Ohio

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You profit in two ways by Dominion Service:

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Second—In securing a complete supply from one source,

—With positive assurance of highest quality,

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—And your order is given the prompt, careful attention which it deserves.

Whether you buy oxygen and dissolved acetylene only once in a while, or in large quantities on contract, our plan of doing business promotes friendly relations which create a complete, smooth and satisfactory service.

We shall appreciate the opportunity of talking to you about Dominion Service.

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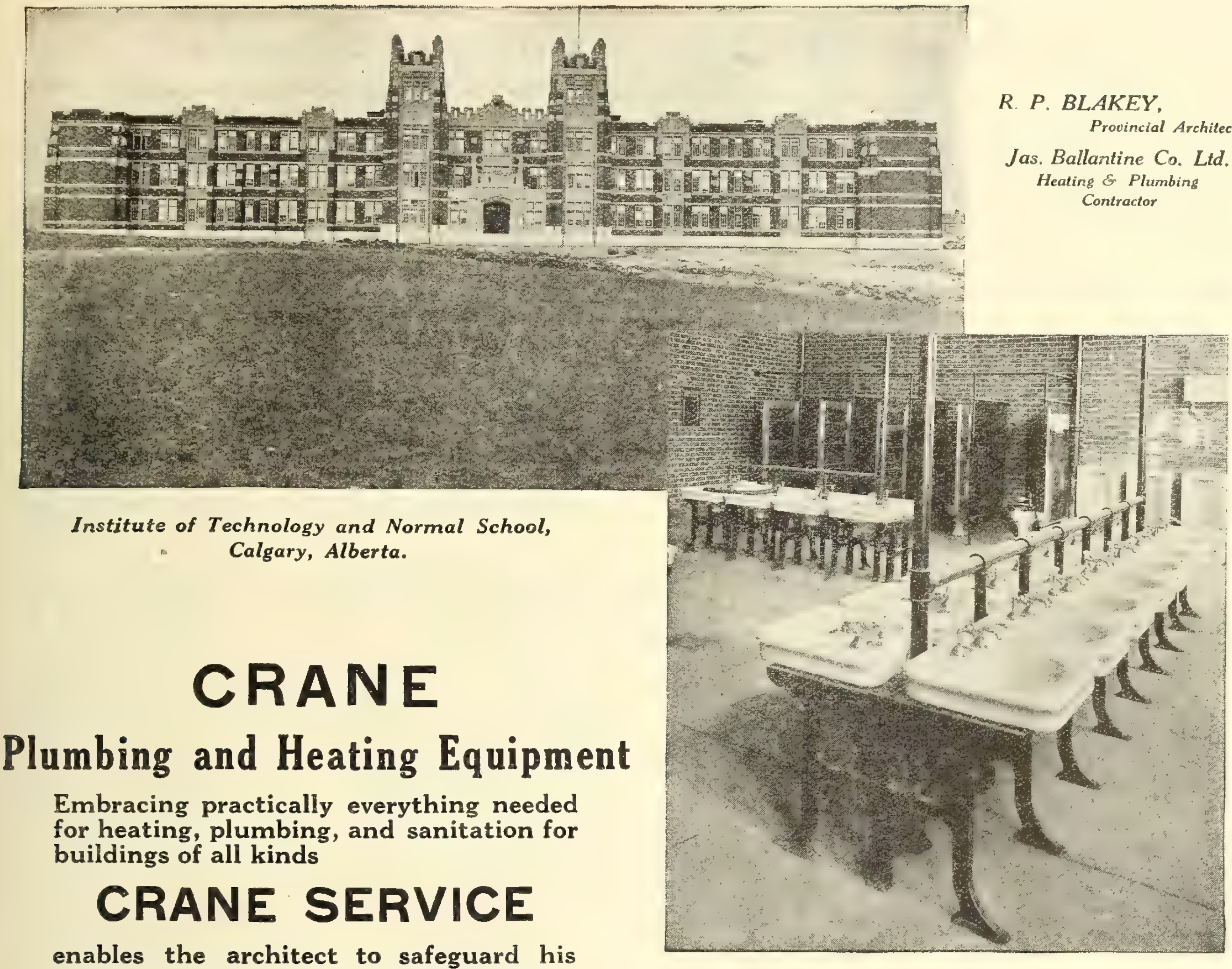

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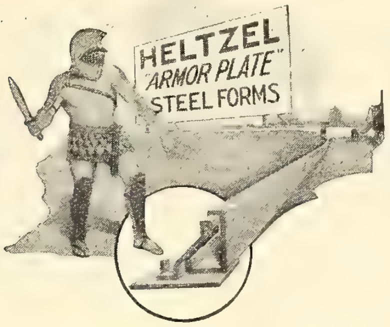

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1 Is your form made of No. 7 gauge material ($\frac{3}{16}''$ thick)? ?

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7 How many rivets in your rail? (Heltzel has none.) ?

8 Don't your rails bend after awhile? ?

9 You say it is easy to lift the forms off the stakes. Now all stakes will mushroom after a while. That means I will have to pull the stakes first, then the form. Haven't you contradicted your own argument? ?

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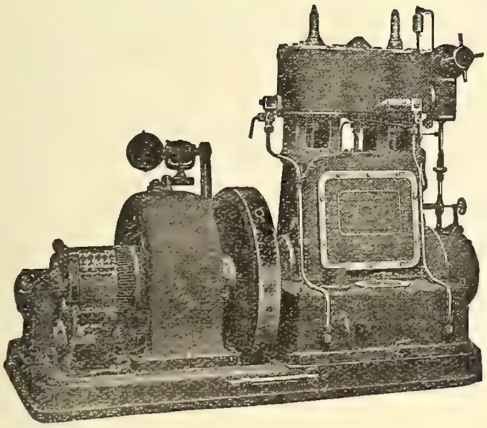

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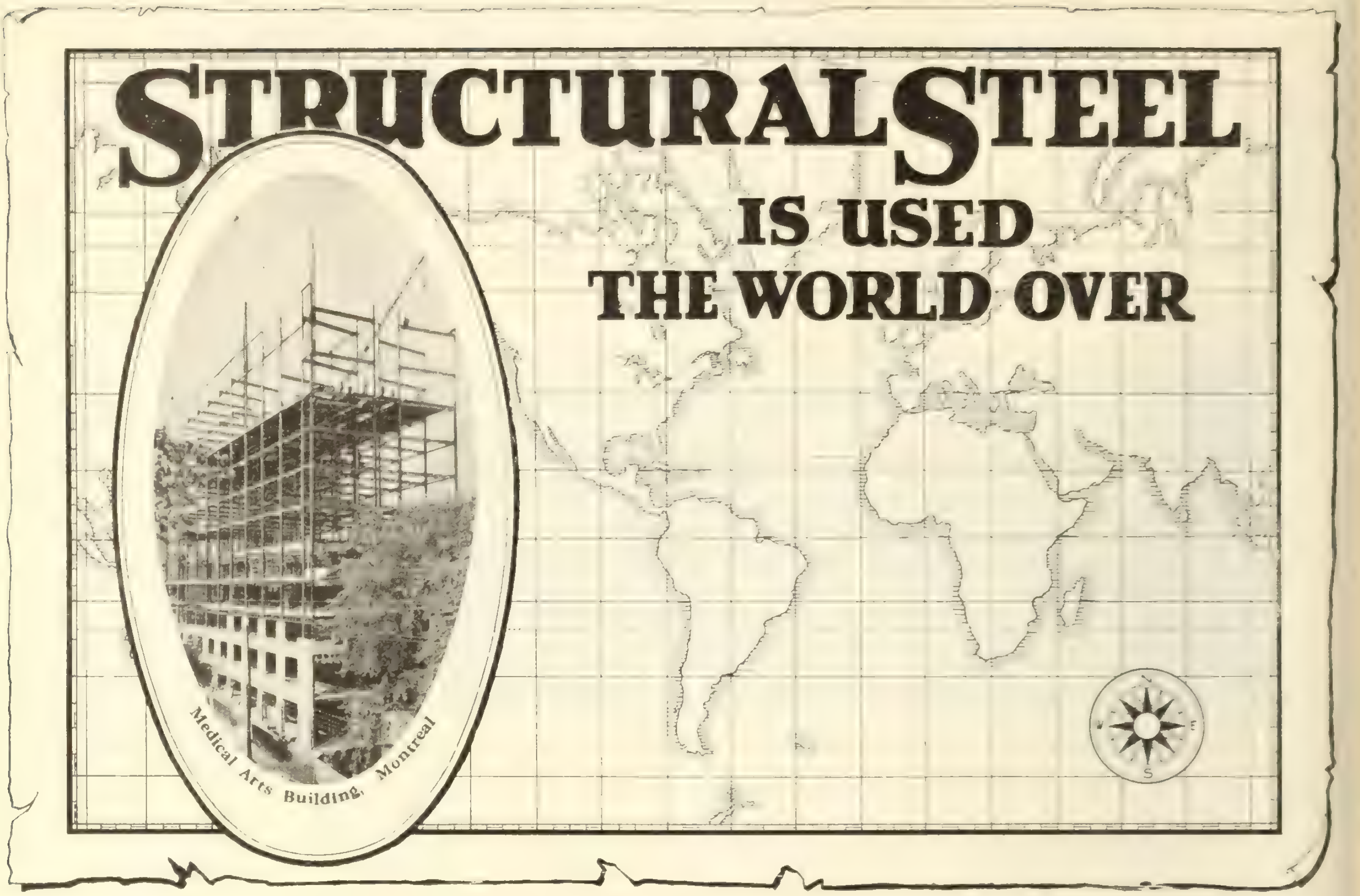

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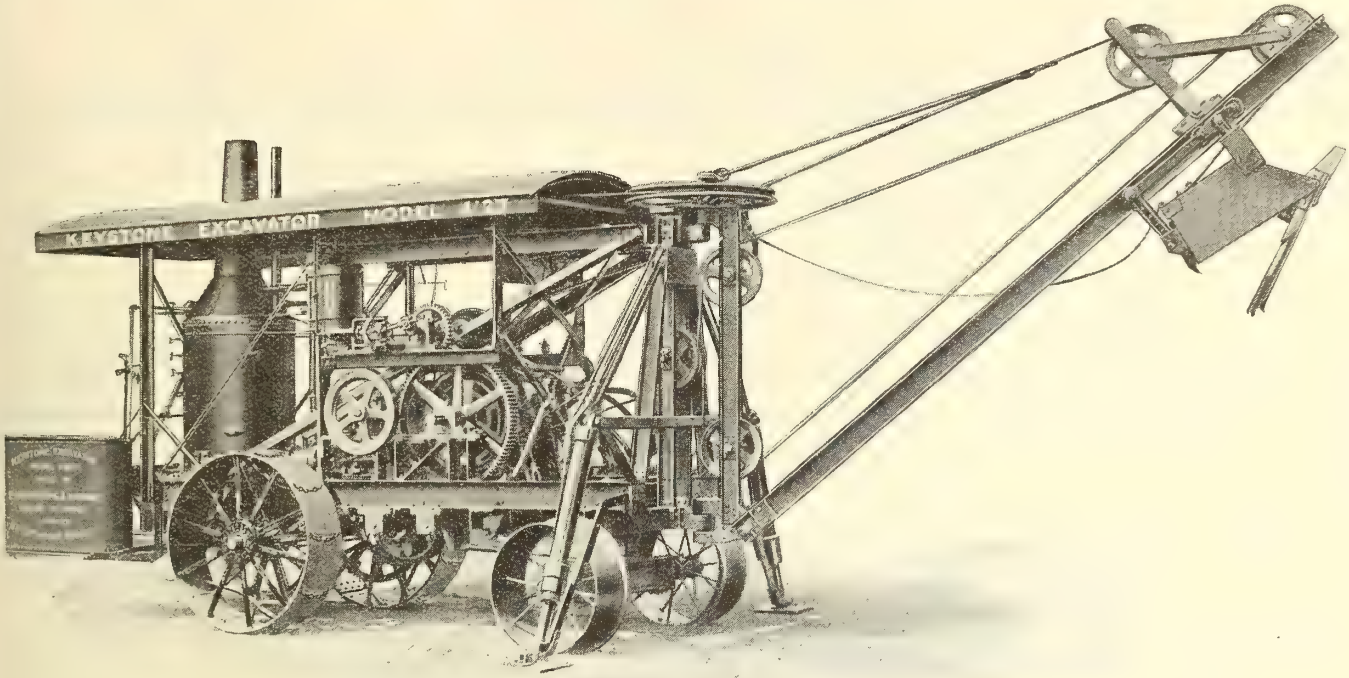

New Keystone Excavator Model 4'23 showing Skimmer Scoop as used for road grading and shallow excavation

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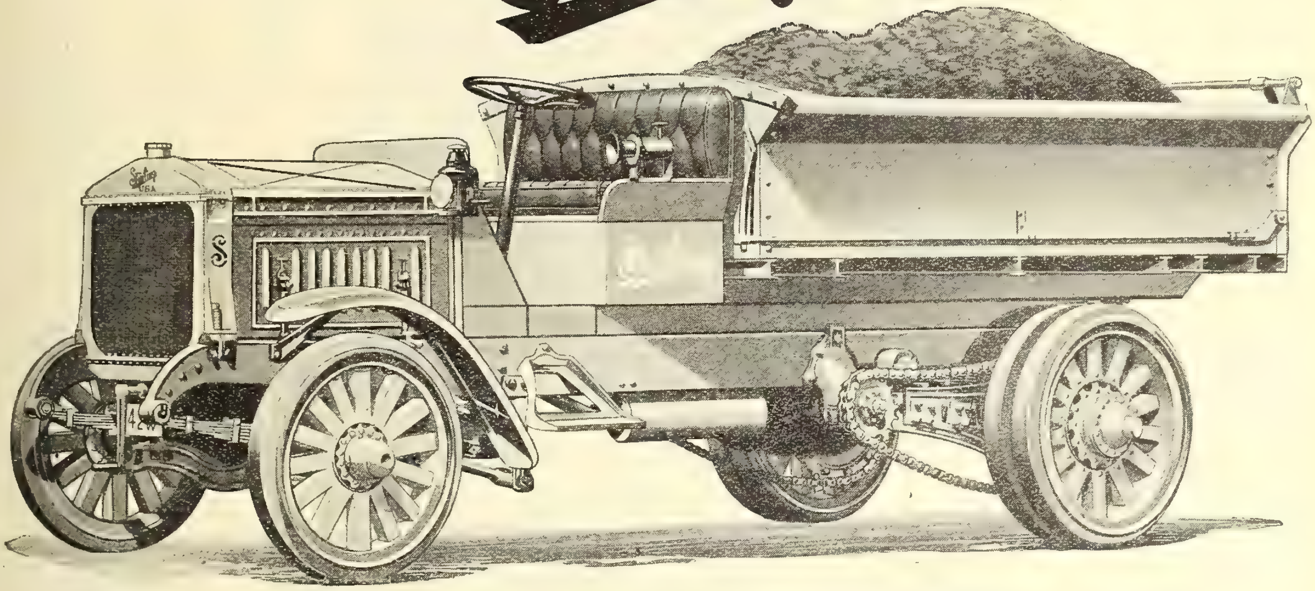

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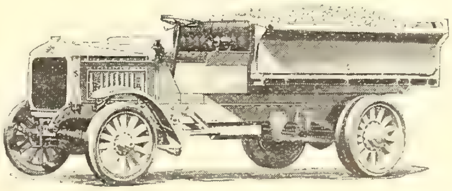

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Where Some Building Mechanics Have Disappeared To

Some recent figures published by the Federation of Construction Industries covering occupational statistics in the United States throw an interesting side-light on the building situation. From these figures it is evident, not only that the lack of a proper apprenticeship system is making it impossible to keep pace with the increased demand for skilled labor, but also to what extent more profitable or more agreeable employment has made inroads into the ranks of building mechanics. There were actually fewer brick and stone masons in 1920 than in 1910 by 23%, fewer laborers by 28%, fewer painters by 9% and fewer plasterers by 20%.

Where some, at least, of these have disappeared to is shown through the published figures of the Federation. The number of laborers now employed in rubber factories has increased, over the same period, by 280%; the number of laborers in petroleum refineries, by 188%; automobile laborers, by 428%; and chauffeurs by 522%. The actual figures referring to these different trades are given below:

	1910	1920	Decrease	Percentage
Brick and stone masons	169,402	131,264	38,138	23.6
Building laborers (general)	869,478	623,203	246,275	28.4
Painters	273,441	248,497	25,944	9.5
Plasterers	47,682	38,255	9,427	19.8

			Increase	Percentage
Rubber factories (laborers)	13,546	51,467	37,921	280.0
Petroleum refineries (do)	11,215	31,795	20,580	188.6
Automobile laborers	15,783	83,341	67,558	428.0
Chauffeurs	45,786	285,045	239,259	522.0

In the face of these figures it is easy to see one main cause of the increased and increasing cost of construction and the vitally urgent need of an attractive and effective apprenticeship system.

Will There be the Same Coal Trouble Next Year?

Now that the worst of the winter is behind us, and the coal situation is bound to ease little by little, it may be profitable to look back over the past few months and size the situation up in the light of our recent experiences.

Canada now knows what it means to be short of coal. We have even had a few fatalities as a result of the shortage. At best the vast majority of us have lived in a more or less nervous state of anxiety lest the worst should happen. We have all been obliged to use inferior quality of fuel and we have paid the highest prices.

We are very much in the position of a motorist who has been travelling along mile after mile with the knowledge that his gas is dangerously low—but he reaches the gas station on his last drop. Would this man be fool enough to start off without refilling? In other words, are we going to sit by and wait for a recurrence of our trouble next year?

Two facts have been made evident by the happenings of the past winter: (1) the United States' coal operators have us at their mercy, both as regards supply and price and (2) the average citizen will not use any other fuel than anthracite unless he is frozen to it. Of the first it may be said that, in the main, we appear to have been treated fairly in the matter of supplies. This is due to two causes no doubt—the first that we are good customers and the second that we have it in our power to withhold the export of electrical energy. If it were not to their advantage we need not expect consideration, as our neighbors to the south have no world wide recognition as philanthropists. Pressure may easily be brought to bear by sections of the United States, not interested either in Canada as a coal market or in Canadian electricity supply, and we may find ourselves unceremoniously cut off. Sooner or later it

No. 92

Canada's Engineers—F. B. Goedike

Last week the council of York Township, which municipality adjoins the city of Toronto, Ont., appointed as township engineer F. B. Goedike, a 1910 graduate of Queen's University, Kingston, and an engineer of wide experience in municipal and other fields. Prior to graduation from Queen's, Mr. Goedike served first as transitman on the construction of the Ottawa-Hawkesbury line of the C.N.R. on which there were some very heavy sidehill rock cuts. Later he was chief of party on timber limit surveys in the Lake of Woods District, and at another time in charge of a party on plane table surveys for the Canadian Pacific Railway irrigation department, Calgary, Alta.

After graduating, Mr. Goedike became assistant engineer of the construction of 22 miles of main canal and 50 miles of small ditches for the Canadian Pacific Railway irrigation department. The main canal had a bottom width of 42 ft. and carried 7 feet of water, the work requiring steam shovel and tractor excavators and elevating graders. In 1912 he took charge of a survey party on the hydrographic survey of Toronto Bay for the Toronto Harbour Commission, later being appointed resident engineer of the sewer department of the city of Toronto on all classes of sewer construction. In 1915 he accepted an appointment as locating and estimating engineer for a commission investigating radial railway entrances for the city of Toronto, while a few months later he joined the staff of the Toronto Harbour Commission as assistant engineer, remaining with this organization until 1918 when he engaged himself with Barber & Wynne-Roberts, consulting engineers, Toronto, on water works and sewers. For 3½ years he then did designing and estimating work on bridges, sub- and superstructures for the Hydro-Electric Power Commission of Ontario. In 1922, after working on water works extensions for Toronto, Mr. Goedike became resident engineer on tunnel sewer construction for the city of Hamilton, Ont., which position he has just given up. He is a member of the E.I.C. and of the Association of Professional Engineer of Ontario.

Mr. F. B. Goedike

will come anyway, the only debatable question being—how soon?

Perhaps the weakest point in our armour is not our dependence on United States coal but the fact that United States coal operators realize our dependence—that they have us "on the hip." Under such circumstances it is almost useless for us to try to bargain either for quality, quantity or price.

What are we, as Canadians, going to do to remove this yoke from our necks—to assert and maintain our independence of a nation which, no matter how friendly, is, naturally, operating entirely in its own interests?

Building Activity in 1923 Will be Greater Than Last Year

There is a wide-spread optimism in Canada due to the excellent industrial outlook, according to the "Canadian Building Review" Lumber is in notably brisk demand, plans are being perfected for an extension of operations in the iron and steel trade, pulp and paper manufacturers are well supplied with business, and prospects for a large amount of new building are bright. It is expected that at least three hundred and sixty-five million dollars will be expended on new construction during 1923. All evidence points to the fact that there will be available an ample amount of financing for this great volume of projected building construction.

The problem of labor conditions is one on which no forecast can be made, but it is quite probable that 1923 will show a fairly good spirit of co-operation between employers and labor in the building industries. Labor leaders are becoming more foresighted, and in certain of the trades there is a growing interest in the apprentice problem and in the idea of admitting a larger proportion of new men into the ranks.

The great drop in construction costs is over, and those who wish to build may do so in 1923 without fear of loss through the shrinkage of existing building values incidental to rapid price deflation.

During January, construction contracts awarded in Canada, according to MacLean Building Reports, Limited, amounted to $9,840,800 compared with $8,392,600 in January 1922. Residential building accounted for 26.5% of the January total and amounted to $2,604,400. Business building amounted to $2,858,420 or 29%; industrial building, $1,916,000 or 19.5%; public works and utilities, $2,462,000 or 25%. The value of contemplated new work during January amounted to $36,714,600.

England Turns to Her Empire

At last, after a dozen futile conferences, England has parted from France on the question of reparations. The rupture was a matter of temperament and was inevitable.

England cannot co-operate with France, except under pressure of war. There is no way of harmonizing the two points of view.

The Entente will have no public funeral, but it is at an end. France may now go ahead in her self-chosen role of chief executioner, and spend $300,000,000 in getting $200,000,000 out of Germany. Such is the English opinion.

The truth is that England has been forced to return to her old policy of isolation. This is the traditional British policy, but twenty years ago it was temporarily abandoned.

"We have not a single friend left in Europe," says a London editor.

Russia is extinct. Italy is aloof. France is independent and Belgium has taken sides with France.

The new ideal of the English people is a self-supporting, co-operative League of Nations, all under the English flag.

For eight terrific years, England has had her fling in international adventures, and now she has had enough. She wants no more internationalism. She is turning her attention to her own Empire. That is the most significant national tendency in the British Isles at the moment.

England never has appreciated her Colonies more than she does in the present crisis. The Colonies have made no trouble. They have paid their debts, while foreign nations have not.

Australia has paid more than France, in the last four years. Australia owes England $450,000,000 and has paid $90,000,000; while France owes $3,000,000,000, and has only paid $75,000,000.

Canada, owing $65,000,000, has paid $16,000,000 on account, while Italy, owing $2,500,000,000,, has only paid $40,000,000.

Austria and Armenia have paid nothing, while little Newfoundland, owing $2,000,000, has paid $375,000.

If foreign nations had paid as promptly as the Colonies have, England could have wiped off the American War Loan and had a handsome surplus.

In the matter of trade, too, England is discovering that her Colonies are her best customers.

A member of the Cabinet—Colonel Amery, made a speech to the British Empire Union recently that is very significant. He advocated more trade within the Empire and hinted that the Government might be in favor of a system of "Imperial preference."

"The trade of our own Empire," he said, "is worth 25% more than that of the rest of the world put together."

Another member of the Government is advocating a tax on foreign securities; and a third cabinet minister has declared that the British policy is "to populate the Colonies and in this way make our own markets."

At present, England's best customers are India and Australia. The Colonies, or Dominions, as they are now being called, bought $1,000,000,000 worth of goods from Britain in 1913, while America, Germany and Russia bought only $440,000,000 worth of British goods.

The self-governing Dominions have now a population of 15,000,000 people, all white and all British. Then there are the Dependencies, with 350,000,000 people, all colored.

All told, the British Empire consists of one-quarter of the earth and its people. It produces iron, sugar, cotton, jute, coffee, tea, corn, rice and rubber. It has wool, meat, wheat, lumber and oil. It produces half the diamonds and half the gold.

It is fully as self-sufficient as the United States, and capable of immense development. Canada can support 20,000,000 people and Australia can support 40,000,000.

So, the signs of the times point to a closer co-operation between England and the scattered parts of her stupendous Empire.

Her new Prime Minister is a Canadian, and the Prince of Wales has recently become the Patron of the Canadian Club.

An eminent banker—an associate of Mr. McKenna, is now advocating an issue of "Imperial Currency Bills," on the model of Treasury notes, to be used as currency throughout the British Empire.

Also, it was decided recently that all the materials and products used at the British Empire Exhibition in 1924, must be British. No French wines—no Oregon lumber—no Chicago meat—no Pittsburgh steel. This decision was forced upon the Exhibition Committee by a public clamor.

"We have had enough of foreign entanglements," thinks the average Britisher. "Let us now spend a generation or two on conserving our own possessions, and restoring prosperity to our own people."

Incidentally, this swing from Europe has made England more in favor of some sort of American agreement. There would not be, at least, the temperamental difficulties in co-operating with the United States, that there have been in co-operating with France.—Herbert N. Casson in Barron's Weekly.

Cost Keeping in the Construction Industry

Why it is Desirable to Keep Costs and How They May be Determined—Book-keeping Methods are not Applicable to Cost Finding—Allocation of Various Items

By J. R. HAGELIN
Carswell Construction Co., Toronto

Read at the fifth construction conference of the A.C.B.C.I. at Quebec, P.Q.

Business may be defined as any occupation which men, at the risk of loss, seek to make money by producing commodities for sale, or buying and selling commodities, or by hiring the services of others for utilization at a profit. Or in shorter form, Business is any gainful occupation of which profit is the goal and in which there is "risk of loss."

Mark these words "risk of loss." They determine whether or not any occupation is a business. Contracting must, if this definition be true, and it is a true definition, be a business, and it follows, therefore, that contractors are business men. Moreover, we all of us wish to be called business men, but we can remain true business men only so long as we conquer and overcome loss.

I may assume, I am sure, that all of us now in business as contractors have become so with the determination to make it our life's work and prime interest. To carry out this determination it is necessary that the "risk of loss" remain only a risk and not a frequent actuality. Further, if we are to make contracting a business, we must administer it with profit as the goal.

The profit of a business enterprise is the surplus left over after all the costs have been paid. How hard we strive and how much effort we put out trying to get a profit, but most of us miss consistent or constant profit because we have not paid enough attention or the attention it deserves to cost keeping.

Costs Must Be Sound

Now let us take a bird's eye view of the contracting business. The contractor sells his services by offering to do a certain undertaking for a specified sum of money. He arrives at this price by dividing the proposed undertaking into its component parts, estimating the cost of each, adding them together and then adding thereto a sum for profit. The costs set for each item of work must be true. If they err, assuming that the contractor is in competition for the job with worthy competitors, he will not be awarded work since his estimated costs are higher than actual, or he will face a loss on the job since his estimated cost are too low. This shows that he is not sound in his practicing of business. Not being sound, it follows that he can not survive against competitors who practice the sound principles of knowing every actual cost.

How is a contractor to bid so as to get the work he needs and so that when every contact has been performed he has accumulated a surplus after all exexpenses in connection with that job have been paid? There is your problem, the problem you have asked yourself a thousand times, and the problem that bothers you more than all others combined. The answer to it is: "Knowing your costs." The answer is not for one of you alone, but for all of you.

To know your costs is to know the cost of direct labor and direct materials for each operation, the cost of indirect labor and materials, the general expense, overhead or burden (whichever name you choose) of the job and the general expense or burden of administration of the business as a whole. If you know these then you can undertake a contract in a fixed amount and feel that the anticipated profit will be materialized on every job and the year's business net a real profit.

Objects of Cost Keeping

The primary objects of cost keeping are.

1. To enable a manager to analyze unit costs with a view to securing the minimum cost possible of attainment under existing conditions.

2. To provide data upon which to base estimates of the probable cost of projected work.

With the regular and frequent unit cost reports before him, the contractor analyses them by comparing them with corresponding items in reports received from contemporary jobs or from previous work. A comparison with the allowed cost in the estimate form which the bid was made will show whether or not the results being obtained on the job tend toward safety or danger. As a further result of the contractor's analyses of the cost reports, he may discover excessive use of materials in erecting the structure; excessive use of supplies (in operating plant); inefficiency of workmen; inefficiency of foremen; padded pay rolls; excessive loss of time due to plant breakdown, plant shifting, waiting for materials, supplies, etc., and improper design of plant for the job.

Most of us contractors operate, or attempt to operate, two or more jobs concurrently, and therefore the daily administration of each job is in the hands of a salaried superintendent. Except with unit cost reports from the job regularly and frequently, the contractor relies altogether on his visits to the job to judge whether or not waste is being carried on and no accurate idea can be formed until too late, as to the efficiency of the job or as to whether or not the work is costing more than it should. But when he receives systematically the job's unit costs, he knows in time and can attempt to rectify or improve the job before it is too late.

Again systematic analyses of costs lead inevitably to a study of reasons for differences in costs, and this study of reasons is the first step towards inventing new methods and new machines for reducing costs.

Cost Keeping is not Bookkeeping

Cost-keeping as we treat it, is the process of recording the number of units of work and the number of units of materials entering into the production of any given structure, or into the performance of any given operation. The object is to show the efficiency of performance, and it is therefore not necessary that actual money disbursements need be recorded. This is what distinguishes cost-keeping from bookkeeping.

Book-keeping is the process of recording commercial transactions for the purpose of showing debits and credits between different accounts. Book-keeping was devised and developed by merchants; cost-keeping by engineers—the first by students of profit and the other by students of costs.

In the study of costs, the only possible true aim of the student is to reduce all costs to a unit basis, and this is absolutely foreign to book-keeping. Consequently, cost-keeping must be kept absolutely divorced from book-keeping, and both should not be kept by the same department. For cost-keeping is of the nature of daily reports by which the daily performance can be gauged and inefficiency discovered. Book-keeping accounts are not posted promptly and completely until some time subsequent to actual performance.

Often in a contractor's first attempt at a system of cost-keeping, he makes the mistakes of letting his accounting or book-keeping department find and report unit costs, and the results have been so delayed and so misleading because they have been prepared from a book-keeper's viewpoint, that he has quit in sheer disgust and reverted to his original method of guessing.

The Contractor's Procedure

Immediately upon the award of a contract, the contractor's first step is to plan the methods of performance. Having done this, it becomes necessary to secure daily, weekly and monthly reports of such completeness that the contractor can tell readily what the actual and relative performances are. Systematic reporting at regular intervals is the means by which the manager is put into constant touch with the performance of men under him. To be of value, these reports must come at regular intervals, must be in the same form and must show quantitative results that admit of instant comparison with previous reports. To permit of comparison, there must be either similarity of conditions or there must be reduction to units that are themselves practically identical. It is possible to establish units that are comparable, but hardly possible to compare operations on any job with those of current or previous jobs in any way but by units; that is to say, no two jobs of excavation are identical in every respect for they vary in facility and in length of disposal, and therefore, if 1,500 cu. yds. cost at the rate of $1.50 per cu. yd., the contractor cannot tell if that cost represents efficiency or inefficiency. If, however, the cost report shows the length of haul away as one unit of cost per cu. yd., and the picking and loading as another, he may determine the job's efficiency and learn a unit cost which can be used as a basis in estimating some other job.

Where He May Easily Go Wrong

The progressive contractor, when estimating a proposed piece of work, measures up the quantity for each operation into which the job divides itself, and prices accordingly. Unless he is receiving reports from current and past work, giving actual unit costs as before mentioned, he is guessing to a great extent in pricing the estimate, and if he lands the work, his actual costs may and probably will vary to an alarming degree.

To illustrate. Suppose we assume he is estimating a one storey reinforced concrete building and takes off the quantity of slab forms by contact measurement. Suppose further, he has just completed an eight storey job of the same type and has not kept unit costs on it, but does not know that there were a certain number of square feet of forms which cost altogether a certain sum of money, from which he finds a cost per sq. ft. for all operations in connection with this form work. Suppose further, that he now prices the one storey building form work with the cost per sq. ft. obtained on the high building. In one case he has re-use after re-use with its consequent reduction in material costs and lessened labor cost; in the other, he may have to supply as much material as will cover all the work and give him only one use. In the latter case, his labor costs will be higher because he does not get any preliminary make up for repetition work. Undoubtedly when the one storey job is completed, he will find a large over-run facing him for this operation. Had he maintained a system of cost-keeping, he would have known how much it cost him for make-up as one unit, erection as another, and stripping as a third, and could then price his estimate very accurately.

Every operation in building a structure does not lend itself so readily or easily to subdivision into prime units and at first glance it may seem too difficult and expensive to obtain. The cost can in most such cases be quite accurately determined by time studies at intervals and reported to head office. A stop watch will prove itself invaluable on every job.

The contractor's field organization will, if they are keen to do their best, become exceedingly interested in the daily cost results as they would in a physical contest. The result to the contractor will be constantly diminishing costs.

The Allocation of Labor Items

Unit costs as reported from the job, should never include anything but the direct labor and material expended thereon. No superintendent or general foreman should be included in the labor costs, nor should these units include any material costs such as coal, plant supplies, repairs, etc.

In pricing out any tender, the only accepted method is to determine for how many weeks the superintendent, timekeepers, material clerks, general foremen, watchman, etc., will be necessary to complete the jobs and price them out in an item of indirect labor expenditures. Included in this item will be all travelling time and expenses. So that the execution of the job may be compared to the estimate, the cost reports should report these expenditures under their special heading. Any attempt to make unit costs include their portion of such indirect expense is fatal to any real knowledge of unit cost.

So also with the material items whose cost is not a direct charge against unit operation. Such items of indirect material expenditure are fuel, oil, tools, supplies, plant serving numerous or general purposes, field buildings, structures, nails and such items or direct materials whose cost to apportion involves too much effort. These are to be reported separate from any unit cost and included in estimates under their own caption.

Entering into the costs of every contract, we have such items of expenditure as those for city permits and fees, insurance, bonds, field office expenses, light, telephone, workmen's compensation, public liability, rent, taxes, interest on loans and freight and cartage not directly apportionable. These amount to a very respectable sum even on small jobs, and they should each be anticipated when estimating and compared when reported by the job as expended.

The arrival of materials on the job is as a rule in advance of their immediate absorption into the work.

It becomes necessary to unload them and store awaiting the time of use. The cost of receiving, unloading and storing should not be charged into a direct unit but should be kept separately, and thus a record of the cost of handling materials will be found and the contractor can see if the job is handling this end of the work with explicit efficiency.

General Expenses Which Must be Included in Cost

Every part of the work on any contract so far mentioned, can have its cost accurately determined and reported for analyses and comparison and use in future estimates. There are, however, further expenditures in connection with every contractor's business which have to be met by the various contracts. These are head office salaries and administration expenses, office rent, etc., loans, losses, bad debts and unlooked-for expenditures commonly called contingencies. These can be reported only in percentages of the total prime cost of the job or as a percentage of the direct labor of each job. Whichever way the contractor chooses, he must be sure he gets a check on them frequently, so that the percentage allowed for these costs is practically right. It is an appreciable item for it varies from about 3% to about 10%. It must be included in each tender for if omitted, a good portion of anticipated profits are wiped out at the end of the fiscal year.

For the past several years, we who have been tendering on jobs have been struck with the wide range from low price to the high price, but you have probably noticed that on each occasion, there have been say three or four bids which have not varied from each other by more than a small per cent. It is conceded that the latter are the proper figures, and you will find that mostly these are the contractors who know their costs and estimates on accurate knowledge. Their price is the one that would realize for them a reasonable profit. A less price only nets a wage at the best, and a contract let on the low price is not satisfactory to the contractor who got the job and prejudices the public against the profession since they fail to realize that the proper price is higher than the one at which the job was let.

What Babson Thinks of 1923 Prospects

The Worst of the Business Depression is Over and the General Outlook is Relatively Good—The Trend in Industrial Activity and Commodity Prices—Long Swing Tendencies

By WM. R. MATTSON

Babson's Statistical Agency, Wellesley Hills, Mass.

A study of American business conditions shows that the worst of the business depression is over. Half of the depression area was completed by the summer of 1922. Certain sections of the country, it is true, indicated their improvement before this time while other sections are still experiencing a readjustment. In the case of Canada, the indications are that we are just about at the turning point. Consequently, the outlook at present is much better than it was a year ago.

General Outlook is Relatively Good

An analysis of the probable trend of business during 1923 shows there are certain business fundamentals that are very optimistic while others indicate that a further readjustment will be necessary. The sum total of these conditions, however, is optimistic. Statistics show that a little over 55% of the area of depression is over. That means that there is still about 45% of the depression area to cover before we can feel that we are definitely above the normal line of business. Hence, the general outlook for the coming year is one of improvement rather than one of great prosperity.

During a period of readjustment, the effects of inflation are changed and a basis is made for improved business conditions. Efficiency is increased, commodity prices decline, and interest rates approach more normal levels. To a certain extent, we are now laying the foundation that will bring about true prosperity. A further analysis of the business conditions in various sections of the United States and Canada indicate that although the majority is fundamental, there is creeping in an amount of artificial stimulation that indicates danger ahead. Prices of certain goods are still fundamentally too high and are being increased by artificial means. Due to an abnormal shortage of labor in a few industries, wages have been increased out of proportion to the general wage trend. These artificial stimulants combined with the fundamental improvements in business have brought about a too rapid increase during the past six or seven months. Hence, although the general outlook for 1923 is relatively good, there are several danger points ahead that should be carefully studied and avoided if possible.

Over-Capacity of Industry

By studying the fundamental conditions in your own and allied industries, your gross profits during 1923 should increase and be greater than those of 1922. Study the manufacturing capacity of your industry. Most of our important industries developed a high producing capacity during the war years which at the present time is much heavier than necessary to supply the demand. This applies to such industries as iron and steel, tires, phonographs, and many other lines. Plant extensions should be very conservative in these industries. Failures during 1922 have been heavy and competition will continue to bring about numerous bankruptcies until this excess capacity is largely absorbed. Last year, several important business mergers were started. Excess capacity will cause a continuance of this trend toward industrial consolidation during 1923.

Because of this surplus capacity, labor troubles, a conservative demand, and other factors, many of our industries were operating far from capacity production during last year. The average manufacturing activity during 1922 was 60% of capacity. In 1921, it was about 40% while in 1923 activity should average about 75% of capacity.

In order to obtain your full share of 1923 business, you should first take into account the probable activity and spending power of Canada and the United States and also the various sections in those countries. The relationship of the spending power to the trend of commodity prices is of considerable importance. Furthermore, in order to meet competition and a possible decline in commodity prices, sufficient attention must be paid to keeping down producing costs. This in turn brings us to an analysis of labor conditions, overhead costs, transportation, and the various factors in the cost of distribution.

The probable trend of the spending power of the public or the trend of demand for your goods during 1923 should be the first consideration in making plans for the year. There is still a strong tendency amongst business men to lay too much stress on the cost of production and distribution. This applies especially in determining the future price trend of your products.

Industrial Activity Will Lead

A study of business conditions over a period of years shows that prosperity and depression travelled across Canada and the United States in a series of waves. When this depression started, its effect was first noted in the industrial sections. The silk industry, for example, closely followed by the other textiles, was the first to start a decline. The depression area started in the New England states and then travelled south and west. Now that the improvement has started, the indications are that the path of recovery will be approximately the same as the path of depression. At the present time, the industrial sections of the United States and Canada have relatively the best outlook. The farming districts are improving. In the States the spending power of the South will be better than the spending power of the middle West. In Canada, the industrial centers will also lead, followed by the mining districts, and finally the agricultural sections.

As a further check on the trend of business and spending power in Canada, particular attention should be paid to what is happening in the States. It is well known that business changes in Canada lag behind similar changes in the United States. A direct comparison of these two countries shows that this lag varies from three to twelve months. A chart compiled from bank clearings in Canada and the United States with the seasonal fluctuations eliminated shows this point very clearly. In the year 1915, for example, the trend reached a low point in the United States during the early part of the year, then started slowly upward during the summer with a distinct improvement in the fall months. In Canada during that year, the trend was distinctly downward until the fall. The turn in the trend occurred during October.

It is interesting to note that over a period of years, the general trend of the two countries is the same. After the turn occurred in 1915, the business trend in the United States and Canada was distinctly upward until 1920. The high point in the United States was reached during the spring months. The trend in Canada, however, continued distinctly upward until the latter part of the year. During 1921, both countries showed a decline. In 1922, the trend in the United States reached a low point during the early part of the year and then started upward. The curve for Canada has shown a downward tendency throughout the year 1922 although the slope during the last six months was very much less than during the first part of the year. The indications are that the low point has been reached and that 1923 will show an improvement corresponding to that which has been recorded in the United States during 1922. This makes the outlook for Canada very much more optimistic than it was a year ago.

The Trend in Commodity Prices

Next in importance to the probable business trend during the year 1923 and the spending power of the public is the trend of commodity prices. In analyzing this situation, we should consider not only the outlook for the coming year, but the probable long trend outlook for commodity prices. Now what are the probable price changes in 1923? There was a comeback in commodity prices last year in response to better business. From the low point of 155 in April, the Babson industrial commodity index increased to 172 the latter part of the year or an 11% advance. Agricultural products increased in greater proportion and at present are approximately 19% above a year ago. The important factor, however, is that the great gap between these two classes of commodities is closing. Throughout the war years, and the depression years of 1920 and 1921, there was considerable divergence between these two groups. Industrial commodities during the past two years have ruled relatively higher than agricultural commodities. Both groups, however, have been increasing since the middle of 1921 and as a whole now average about 30% above the maximum point.

There is one other point. Commodity prices from August to December advanced 15% which is much too rapid for economic health. The truth is, production, distribution, and stocks were affected by the coal and railroad strikes. Buying was stimulated for protection and prices responded. We are rapidly approaching the point where artificial forces will be eliminated. Certain commodities are bound to weaken. The main points in the commodity situation for 1923 are as follows: (1) the upward swing will lose momentum, reaching a peak in early 1923; (2) there is a strong possibility of a reaction before the year is over; (3) the average price of commodities for the year will be higher than in 1922. Index figures during the next few months may be somewhat higher but this prospect does not justify heavy buying. We are in a very sensitive period. Purchases in most cases should be limited to the early part of this year. Only those products that are relatively low should be bought from the long swing standpoint.

Long Swing Tendency is Downward

From a long pull standpoint, the general trend of commodity prices should be downward. Fluctuations will occur from time to time and the increases will be largely temporary. Taken over a long period of years, a plot of commodity prices shows that there have been several cycles of long duration. The peak prices in most cases have been brought about by war conditions. Considering the commodity price trend since the end of the American Revolution, we find a gradual increase to a peak in 1810 brought about by the abnormal war conditions in Europe. There was then a broad decline broken by various fluctuations to a low point in 1850. This was followed by a rise sharply accentuated by the American Civil War. From 1865 another decline was recorded to a low point reached about 1896. Since then, a rise has occurred and another peak was established by the World War conditions. We are all familiar with the trend since that time. Plotted on an index basis, it is interesting to note that each of these three peaks rose to approximately the same level. Furthermore, each was followed by a radical decline and then a more gradual drop over a period of years. The probability is that this condition will be followed during the next few years. Consequently, business policies should be formed to meet a gradually declining commodity market. On a rising commodity market, the speculator is the most successful man while on a declining market the conservative business man who studies fundamental conditions is able to obtain the greatest profits.

The indications are that the termination of the present rise in commodity prices will be brought about by a declining demand rather than an oversupply of goods or a reduction in producing costs. Statistics clearly show that the spending power of Canada and the United States is better than a year ago, but it has not increased sufficiently to absorb any radical price increases. Employment last year was rather spotty and strikes were numerous. Furthermore, the farmer has not arrived at that stage where he can afford to pay much higher prices for the goods he buys until he receives a better return for his products. Reports are constantly being received that price increases on clothing, boots, and shoes, farm implements, and other manufactured goods are experiencing considerable opposition. This in turn has caused distributors and manufacturers to become more conservative in placing their orders for next summer and fall deliveries. In some industries, producers have been able to cut down overhead costs, increase labor efficiency, and in other ways have offset the price increases of basic commodities. Everything should be done to keep prices as low as is possible with a fair margin of profit. This applies especially to the building industries as any radical price increase in building materials would tend to seriously affect what promises to be a very good building year.

1923 Labor Conditions

In further analyzing the 1923 outlook, particular attention should be paid to labor conditions. In the United States, the present immigration law has brought about an unbalanced situation in our labor supply. The average yearly pre-war addition of workers to the U.S. due to immigration amounted to over 505,000. In 1922, we had a total net immigration of working people to the United States of only 21,131. The situation is even worse when we consider the supply of common labor. For the same fiscal year 1922, there was an actual exodus of common labor over and above those who came in of 67,332. This explains why the industries such as iron and steel and others hiring unskilled labor have experienced an actual shortage and consequent wage increases. It also shows one of the reasons why so much labor has gone from Canada to the United States during the past year. The probability is that the wage level will be high through the greater part of 1923. A number of industries have already announced increases and further advances will be reported during the next few months. The number of wage increases this year will probably exceed the decreases.

The trend of the other fundamental factors of business indicate a good year ahead. Credit conditions will also be helped by the relatively low interest rates that are now available. 1923 should be a year of easy money and large bank reserves indicate that healthy business concerns will not be hampered by lack of credit. Furthermore, the stock market has indicated better times. The unsettled foreign situation is probably the most bearish argument in the outlook for the year. However, there are enough optimistic features that will be noticed in Canada and the United States throughout 1923 to largely offset this situation.

A Period of General Improvement

In view of these various factors, the indications are that 1923 will be a period of general improvement in business. Competition will continue keen. Prices cannot be pushed up very far because the spending power of the public has not advanced sufficiently to absorb these increases. This means that the opportunities in 1923 will be for those concerns which buy to the best advantage, produce most efficiently, and sell most economically. Hence, it is of very great importance during the coming year that a study be made of fundamental conditions, the probable trend of commodity prices, and the outlook for different sales territories—in other words, to know what and when to buy and where and when to sell.

Conferences on Water Power Development

A series of conferences on water power development has been arranged for students and others interested in hydraulic engineering by Prof. R. W. Angus, head of the department of mechanical engineering, University of Toronto, and is being held in the Mining Building of the University. The lectures began on Feb. 19 and will continue until the 27th. For the remainder of the conference the program is as follows:

Thursday Feb. 22 at 4.30 p.m.—"Methods of Measuring Stream Flow and of Estimating the Available Water Supply" by C. C. Covert.

Friday Feb. 23 at 4.30 p.m.—"Modern Hydraulic Machinery, Turbines and Governors" by D. J. McCormack.

Monday Feb. 26 at 4.30 p.m.—"The Testing of Hydraulic Turbines and Measurement of Efficiency" by Prof. C. M. Allen.

Tuesday Feb. 27 at 4.30 p.m.—"The Power Plant from the Operator's Standpoint" by H. C. Don Carlos.

Auditorium for Ottawa

Ottawa is to have an auditorium. Arrangements have been definitely made for the erection of a big structure at O'Connor, Catherine Streets and Argyle Avenue, in the geographical centre of the capital, at a cost of $300,000. The site for the concert hall was purchased on January 22 and announcement was made that building operations would be started early in April. The men behind the Auditorium Company include T. F. Ahearn, a prominent local resident, Major F. D. Burpee, general manager of the Ottawa Electric Railway, and W. H. McIntyre, general manager of the Ottawa Car Mfg. Co. The main amphitheatre of the structure will seat 9,000 people, while there will be a small concert hall which will hold 600 persons.

J. A. Bernard, 21 St. Peter St., Quebec, P.Q. has been appointed exclusive distributing agent in Quebec city for Trus-Con products manufactured by the Trussed Concrete Steel Co. of Canada, Walkerville.

Dam at Stave Falls, B. C. Being Raised

Also a Sluice Dam is Being Built at Blind Slough and Provision is Being Made for Increased Capacity in Connection with the British Columbia Electric Railway Co.

Increasing demands upon the local central station, the B.C. Electric Railway Co., Ltd., for power have necessitated extensive developments to care for the anticipated load. The largest new purchaser of power is the Britannia Mining & Smelting Co., Ltd., of Britannia Beach, B.C.

Prior to this time the Britannia Mining & Smelting Co. has developed its own power, using two hydro-electric plants of 1950 and 8490 h.p. capacity and two steam plants with capacities of 500 and 200 kv.a. A small creek some seven miles in length has been the source of water supply, but fluctuations in the amount of water available has made the power from the hydro-electric plants variable and incapable of further development.

A 500 H.P. Contract

To care for the increasing amount of power needed, the Britannia Mining & Smelting Co. has signed a long term contract for approximately 500 h.p. with the B.C. Electric Railway Co. This energy will be transmitted at 34,600 volts, using a new transmission line to be constructed immediately. This transmission line will be some thirty miles in length, will cost approximately $175,000 and will follow the line of the Pacific Great Eastern Railway from North Vancouver to Whytcliffe, and thence up the coast of Britannia Beach.

The mining company will construct its own substation and will handle its own distribution. This will enable them to shut down the steam plants and use the hydro-electric plants to care for additional load and to correct the power-factor.

West Vancouver will receive light and power service for the first time when the high tension line to Britannia is built. Construction will start shortly on a distribution system there some twenty miles in length to carry street lighting and single and three phase light and power service.

600 Homes Will Get Electricity

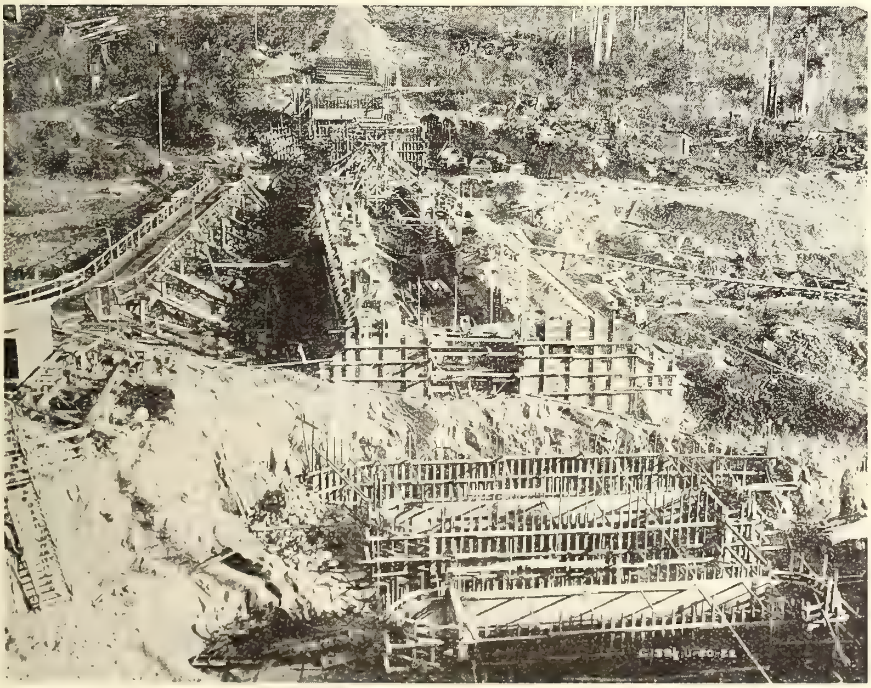
Approximately 600 new homes will have available for the first time electricity for light and power.

To safeguard the interests of all its consumers the B.C.E.R. Co. is building a high tension line by an all-land route from its Lake Buntzen plant to Barnet instead of crossing the south arm of Burrard Inlet by a 2,845 foot span at Barnet.

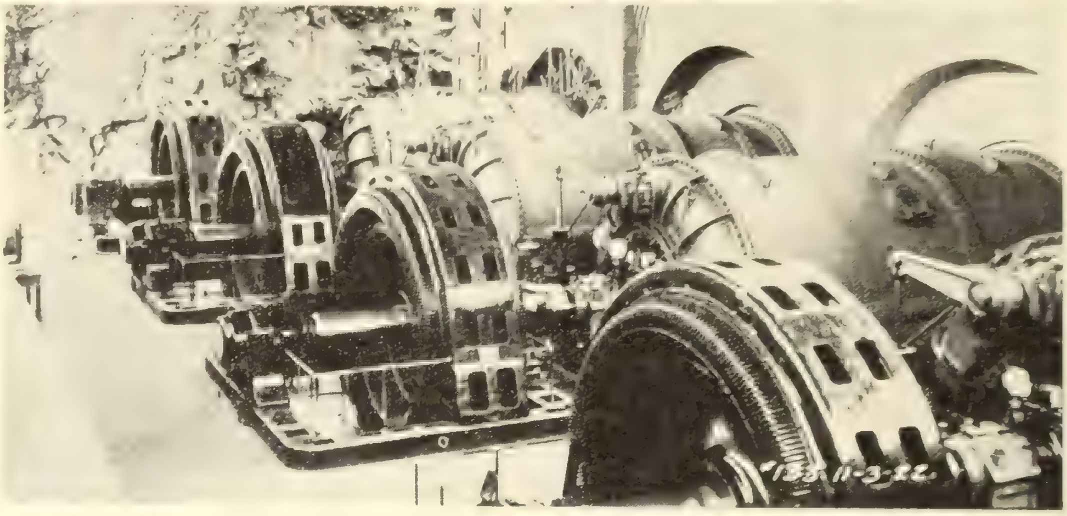
In addition the present line from Port Moody to Barnet will be reconstructed, making an entire new circuit from Lake Buntzen to Barnet.

At present, also, there is further development work going forward at the Stave Falls plant. Recently a fourth unit was installed there, bringing the capacity of that plant up to 35,300 kv.a. and there is still available in the Stave River, within three miles of the present site, water for a total development of 100,000 h.p. The plant now operating consists of four units—turbines, 13,200 h.p.; generators, 8,825 kv.a. each.

Work is now progressing at Stave Falls on raising the main dam 25 feet in height. This necessitates



Construction work in progress on the dike at Blind Slough which will provide storage for 370,000 acre feet of water.



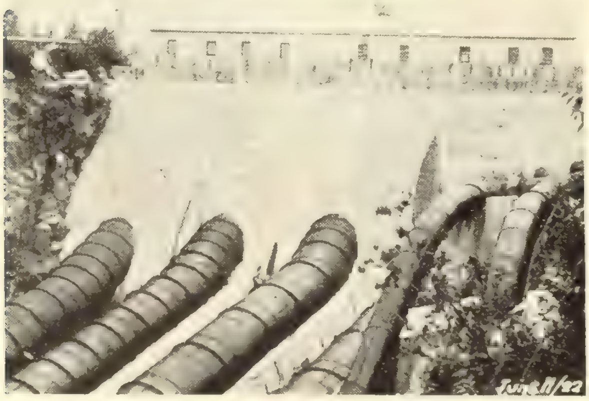
Interior of present power plant of B.C. Elec. R. R. Co., at Stave Lake, showing four C.G.E. generating units

also the installation of new roller gates in the present dam in place of the Taintor gates now in use—the chambers in which the old Taintor gates operated will be filled with concrete to give the dam additional weight.

Sluice Dam at Blind Slough

Stave Lake at present is approximately 18 miles long and has an area of 13 square miles. The increased height of the dam, while making necessary the construction of another sluice dam at Blind Slough, will provide storage for nearly 370,000 acre feet of water.

Construction on this sluice dam at Blind Slough has been progressing for some months and will be completed this season. When completed this dam will be 600 feet long, including approaches, 60 feet wide and 57 feet high.



Main dam at Stave Lake showing four penstocks. Turbines operate under 75 foot head

A unique feature of this construction work is the operation of the narrow guage construction road on the job itself by electric power from the existing plant.

When the main dam is raised and the sluice dam completed a steel highway bridge will be built across the lake at the site of the main dam; the highway will also cross the sluice dam at Blind Slough.

It is quite likely by the time this work is completed that work will start further down the Stave River on the second plant to utilize the water again after it has passed through the present plant at Stave Falls.

Officers of the Engineers' Club of Toronto

At the recent annual meeting of the Engineers' Club of Toronto, the following officers were elected for 1923: W. R. McRae, president; E. G. Hewson, first vice-president; A. B. Cooper, second vice-president; George G. Powell, third vice-president; R. B. Wolsey, secretary-treasurer; J. C. Armer, chairman of house committee; J. B. Carswell. chairman of finance committee; Frank R. Ewart. chairman of admission committee; George R. Mickle. chairman of library committee. The other members of the board of directors are W. G. Gordon, T. D. LeMay, Balmer Neilly, A. V. Trimble, John van Nostrand, A. F. Wells and E. W. Wright. The financial report for the year to 31st of December last showed a very satisfactory twelve months' operations, with a net profit to the credit of the club.

W. R. McRae, president of the Engineers' Club of Toronto

Equitable Highway Provisions Approved

A Committee of the Associated General Contractors Working in Co-operation with Highway Officials, Has Drawn up Recommendations that Aim to Improve Highway Contracting Procedure

The experience of various highway departments and also of many representative construction companies, during the past four years of intensive road building, has indicated that certain modifications of usual contracting practice are conducive not only to more satisfactory relations between the departments and its contractors, but also to keener competitive bidding by responsible companies.

The road building industry has developed to such magnitude and the administrative duties devolving upon the department have so increased, that it becomes essential to eliminate unnecessary difficulties in its functioning wherever possible. One step in accomplishing this undoubtedly depends upon securing the services of the higher type of construction companies, and upon co-ordinating the business principles of public contracting as far as possible with those of contracting in the commercial world. It is with this in mind that a committee of the Associated General Contractors of America working in co-operation with the American Association of State Highway Officials reported on certain principles herewith presented. These principles are outlined in the following recommendations:

It is recommended—

First: Contract Surety.—That where permitted by the law the highway department permit the substitution of approved negotiable securities for bond; the value of the securities deposited, except in extremely hazardous work, to equal not more than 35 per cent of the contract amount.

(The exclusive use of surety bonds is believed to have resulted in the promiscuous bonding of irresponsible contractors, thus increasing the hazard rate, which in turn has been met by greatly increasing the bond premium; also the fulfillment by the surety frequently entails many difficulties of legal procedure.)

Second: Bidder's Bond.—That proposals for highway work require that no bidder's bond will be acceptable, unless accompanied by satisfactory assurance that the surety will bond the bidder for the contract, if awarded to him.

(The promiscuous writing of bidder's bonds, which, in some localities, carry no assurance that the surety will bond the contractor for the work, is believed to exert a demoralizing influence upon public lettings.)

Third: Payments.—That where possible, monthly payments be made not later than a definite calendar date; that final payment be made within a specified time after the contractor has fully performed his contractual obligations; or where final payment is necessarily delayed, that a semi-final payment be made in such amount as the department may consider safe.

(Construction companies are bound to material manufacturers and other commercial concerns by auxiliary contracts, which require payment within a limited time, and failure of the department to make prompt payments to the construction company may entail difficult emergency financing.)

Fourth: Acceptance of Work.—That portions of the road, when satisfactorily completed, be accepted and paid for in sections of reasonable length, and maintenance by contractors terminated.

(Funds retained by a department after portions of the work are satisfactorily completed, involve unnecessary interest charges in the cost of construction and complicate its financing.)

Fifth: Maintenance.—That the maintenance guarantee on highways, after they have been accepted, be divorced from the construction contract.

(The combining of maintenance and construction in a construction contract introduces uncertain elements of expense which should not properly be included in the construction cost.)

Sixth: Classification.—That where feasible the following be provided for:

(a) Excavation to be classified.

(b) No two kinds of work to be included in a single unit where it is practicable to separate them.

(c) Overbreak or slides to be paid for at a proper rate, where the engineer is satisfied that the work is properly handled and that the breaks or slides are not due to the contractor's negligence.

(A comparison of excavation prices between contracts providing for classification and those using a single class indicate that a proper classification, which enables accurate estimating, is productive of lower prices, and a separation of the different classes of work into individual units appears to have a similar effect.)

Seventh: Adjustment of Compensation.—That provision be made for a equitable adjustment of extra expense entailed by:

(a) Delays and suspension of work, due to acts or omissions of department.

(b) Unusual increase or decrease in the original unit quantities.

(c) Acts of God, and other causes manifestly beyond the contractor's control—in those instances where the engineer is satisfied that the contractor is not at fault.

(It frequently becomes necessary for the highway engineer to suspend work through no fault of the construction company, or to take other action which disrupts the procedure and introduces extra cost that can not be foreseen. It is believed economically unsound for a construction company to assume certain risks.)

Eighth: Overhaul.—That a reasonable free haul limit, preferably not over 500 feet, be employed and that some standard means of computing overhaul be adopted.

(The great variety of methods in use for computing overhaul and their uncertainty have made it difficult to predetermine accurately the cost of such hauling.)

Ninth: Retained Percentage.—That ten per cent be retained on monthly estimates.

(An excessive retained percentage on monthly estimates increases the interest charges of the work; and ten per cent in conjunction with the surety bond or securities is believed to afford ample protection to the state.)

Tenth: Force Account.—That on force account work the allowance for indirect and overhead expense be set at ten per cent of the direct labor and upon these amounts and upon the material a ten per cent profit be allowed.

(The settlement of force account work has often been subject to dispute and the use of modern equipment has increased both the proportion of overhead expense and the difficulty of ascertaining its amount.)

Eleventh: Stock Piling.—That, under conditions satisfactory to the departments, payment for material delivered be included in monthly estimates.

(The transportation system of the country is unable to serve adequately the needs of highway construction during certain months, thus making it advisable to stock pile materials, but many responsible companies are prevented from financing stocks of sufficient quantity.)

Twelfth: Arbitration.—That limited arbitration, which will reserve final decision to the engineer in all matters pertaining to prosecution of the work, but will provide for settlement of claims for compensation, be included in construction contracts.

(The settlement of controversy under highway contracts by arbitration has shown not only that the number of disputes and court actions is reduced, but that arbitration itself is seldom resorted to, and that the engineer's hand is thereby strengthened.)

Thirteenth: Administration.

(a) That contracts be promptly awarded and certified checks returned within a specified time where possible.

(b) That written orders be given by the Department for all important instructions and especially instructions to suspend or shut down the work, the latter to state reasons of suspending or shutting down.

(c) That unless a plan for prosecution of the work is given at the time of sending out proposals, the contractor be allowed to pursue his own plan except in emergencies and providing his prosecution of the work is satisfactory.

(d) That inspection of materials be made at the source when practicable and at least before the unloading from cars.

(e) That the departments discontinue publication of the monetary amount of estimates in advance of the letting of work.

(f) That every effort should be made to secure the highest possible type of inspectors and field engineers.

Fourteenth: Day Labor Construction.—That true and accurate cost accounting, showing overhead and indirect expense, be required on all construction work performed by state or county forces, an exception to be made only on miscellaneous work not properly designated as construction.

(It is to the public interest to know the true cost of any public work that a department or other agencies of the state may be called upon to perform by day labor.)

Fifteenth: Legislation.—That an effort be made to modify existing laws in conflict with these recommendations.

Conclusion

In discussing the matters treated in this report with members of the contractors' committee, it was clearly recognized by both groups that the engineer must retain certain prerogatives that can not safely be abridged. His responsibility for the integrity and success of the road demands that his decision as to the results desired must be final. The basis of discussion was one of plain economics and commercial equity, and upon this basis alone the above recommendations have been made.

Contracting Plasterers of Canada and the United States Meet in London, Ont.

Contracting plasterers from every important centre between the cities of Montreal and Chicago, to the number of 50, all members of the International Contracting Plasterers' Association, gathered in London, Ont., on Feb. 2nd, last, as guest of the plasterer contractors of that city, to compare and discuss some of the many knotty problems that are now confronting them in their business activities with very serious consequences.

After a banquet at the Tecumseh hotel, the meeting developed into a round table talk, or experience meeting. Following a general summing up of these experiences it was cleverly shown that one of the greatest difficulties that contracting plasterers in every locality have to contend with is a shortage of skilled mechanics.

References were made to various attempts that are being made to turn out mechanics in a two year term of part vocational and part technical training. The failures of this scheme were described, and it was felt, that we must revert to the old, old, plan of apprenticeships.

One of the Toronto contractors, Walter Boyce, then gave a very interesting talk on organization as a factor of success. As a good example of the effect of organization he instanced the splendid results obtained by the International Association.

Mr. Boyce was followed by Mr. Oscar A. Reum, of Chicago, the president of the International Association, who in an hour's talk gave those present enough to think about for the rest of the year. Simple in speech, and plain in manner, he gave one of the most inspiring addresses relevant to the plastering industry that any group of master plasterers ever listened to. With his long experience with associations, he was able to point out the steps that lead on and up to success, and also how to avoid the many pitfalls that infest the path of the unwary amongst association members, and which when entered lead to disruption and discord.

Following this, committees were formed to devise ways and means whereby the architects, builders and the public generally might be educated up to the point of full conviction that the plastering industry is not only a necessary adjunct to all buildings but that it is also a science and an art, and that it is only when the art of plastering is restored to its old time prestige of being one of the most honorable callings, will we be able to secure a desirable class of young men to take up its study.

Construction Developments During the Month of January

Figures Compiled by MacLean Building Reports, Ltd., Show Trend of Building Activities for Last Month—Details of Contracts Awarded in Eastern and Western Canada

Construction Contracts Awarded in Eastern Canada, January, 1923

	Ontario		Quebec		New Brunswick		Nova Scotia		Eastern Total	
	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value
Apartments	2	$ 100,000	....	$............	....	$............	....	$............	2	$ 100,000
Churches	2	72,000	1	50,000	....	....	....	....	3	122,000
Factories	13	1,621,000	5	235,000	1	4,000	....	....	19	1,860,000
Public Garages	1	20,000	....	....	....	....	....	....	1	20,000
Hotels and Clubs	....	....	....	....	1	3,500	....	....	1	3,500
Office Buildings	4	67,000	....	....	....	....	....	....	4	67,000
Public Buildings	3	61,700	1	26,000	....	....	....	....	4	87,700
Residences	262	1,938,000	74	413,500	1	3,500	2	9,500	339	2,364,500
Schools	2	7,200	3	68,000	....	....	....	....	5	75,200
Stores	32	1,728,400	....	....	3	21,500	....	....	35	1,749,900
Warehouses	6	554,000	3	27,000	....	....	....	....	9	581,000
Total Buildings	327	$6,169,300	87	$ 819,500	6	$32,500	....	....	422	$7,030,800
Bridges	1	30,000	3	70,000	2	47,000	....	....	6	147,000
Dams and Wharves	1	30,000	1	6,000	....	....	....	....	2	36,000
Sewers & Watermains	2	31,900	1	10,000	....	....	....	....	3	41,900
Roads and Streets	4	135,000	10	958,400	....	....	....	....	14	1,093,400
General Engineering	1	850,000	....	....	....	....	1	37,500	2	887,500
Grand Total	336	$7,246,200	102	$1,863,900	8	$79,500	3	$47,000	449	$9,236,600

Construction Contracts Awarded in Western Canada, January, 1923

	British Columbia		Alberta		Saskatchewan		Manitoba		Western	
	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value
Factories	3	$ 44,000	....	$............	....	$............	1	$12,000	4	$ 56,000
Public Garages	....	....	1	1,900	....	....	....	....	1	1,900
Hotels and Clubs	2	8,200	....	....	....	....	....	....	2	8,200
Office Buildings	1	5,500	....	....	....	....	1	9,100	2	14,600
Public Buildings	1	10,200	1	58,500	....	....	1	4,000	3	72,700
Residences	27	111,400	2	7,000	1	1,500	13	20,000	43	139,900
Stores	....	....	2	3,800	....	....	4	28,300	6	32,100
Warehouses	1	2,100	....	....	2	20,500	....	....	3	22,600
Total Buildings	35	$181,400	6	$71,200	3	$22,000	20	$73,400	64	$348,000
Bridges	1	6,200	....	....	....	....	....	....	1	6,200
Dams & Wharves	1	250,000	....	....	....	....	....	....	1	250,000
Grand Total	37	$437,600	6	$71,200	3	$22,000	20	$73,400	66	$604,200

Dams and Dykes on Lake Kenogami

The Quebec Streams Commission Has Ambitious Plans for the Development of the Power Resources on the Chicoutimi River—About 2½ Million Dollars to be Spent on the Work

The following information regarding the new storage development at Lake Kenogami was very kindly given to our Montreal correspondent by the office of the Commission:

Quebec Streams

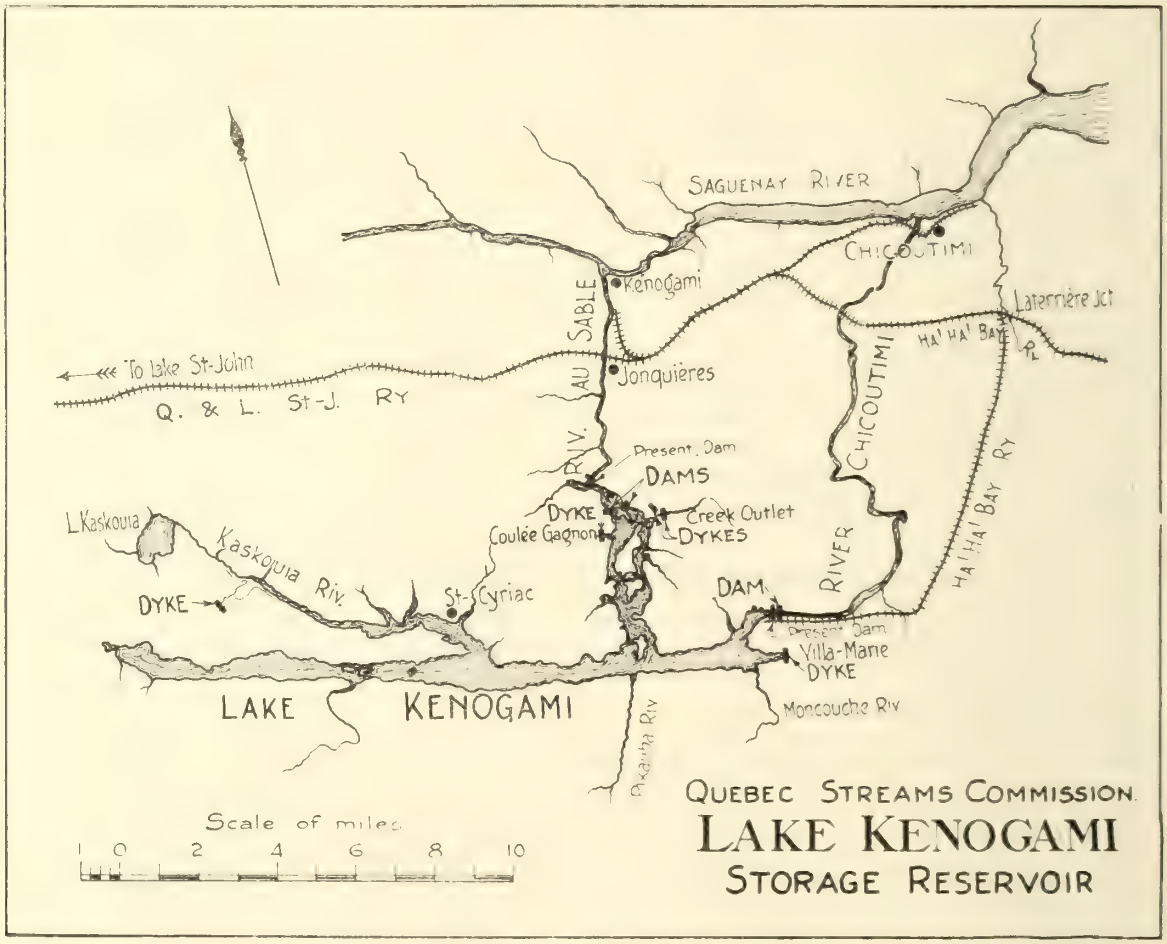
Following the established practice of the Quebec Provincial Government to assist the development of the natural resources of the province it was decided recently to undertake the construction of storage dams on Lake Kenogami. This has already been noted in the "Contract Record."

Following their decision, plans and specifications were drawn up in the Commission's office, and tenders were called in January of this year, the tenders to be in the Commission's hands by February 20th, 1923. It is more than likely that the successful tenderer will be called upon to make immediate preparations so as to commence work as soon as practicable in the spring.

There are two companies in the district which will derive direct benefit from the new storage capacity of the lake. These are Price Bros. Ltd., and the Chicoutimi Pulp Co. The two companies involved have entered into an agreement with the Provincial Government, as represented by the Commission, by which they guarantee to pay to the Commission certain sums yearly to cover interest on the money invested, operating expenses incurred in the maintenance of the dams, and a sinking fund. This contract follows the general practice of the Commission.

Geographical Location

Lake Kenogami is in the county of Chicoutimi about 12 miles west of the town of the same name. Chicoutimi town is on the Saguenay River about 65 miles up from the St. Lawrence. At noted on the accompanying cut Kenogami is a long narrow lake running almost due east and west. It drains an area of about 1,450 sq. miles, a figure that has been fairly accurately established by surveys of the Commission's engineers.



The present low water area of the lake is in the neighborhood of 8 sq. miles and present high water area 12 sq. miles. When the proposed work is completed it is expected to increase the high water area to 21 sq. miles.

There are two outlets from Lake Kenogami both of which flow into the Saguenay as indicated on the accompanying cut. The Chicoutimi River is about 15 miles long and the Ausable is much shorter, being about 6 miles long. The latter river runs through

Jonquiere and Kenogami where there are several large pulp mills, operated by Price Bros. Ltd. and the Chicoutimi Pulp and Paper Co.

Present Storage Capacity of Lake Kenogami

There are at the present time two timber crib dams on the lake, one at each outlet. They have been in use for some years serving as storage dams to regulate the flow for those using the power available. These dams have been storing the water to a depth of 9 feet above low water level. Under these conditions of 9 feet storage the maximum possible regulation which is obtainable is 700 c.f.s. out of both outlets, and the reservoir so operated that for a long period during the winter a flow of only 400 c.f.s. frequently occurs. The Chicoutimi river received 2/3 of the flow and the Ausable river the remaining 1/3.

Proposed Storage Capacity

The plans and specifications recently given out by the Commission call for the construction of dams to store the water to a depth of 32 feet above the low water level. These dams will not be sufficiently high to store all the flood water but are considered to be at the maximum economical height.

With the addition of these dams it is certain that a minimum flow of 1800 c.f.s. will be maintained all the year round regardless of weather conditions. This will be divided as formerly, the Chicoutimi river receiving 1200 c.f.s. or 2/3.

Proposed Structures

The plans as drawn include the raising of the lake by means of two concrete dams, one at each outlet from the lake. The new dam at the Chicoutimi river outlet will be located about 100 feet below the present timber dam, and at the Ausable outlet the new structure will consist of two concrete dams situated about one mile above the present dam at Pibrac. At this point the river divides into 2 outlets both of which will require a dam. Apart from these concrete structures there will be several earth dykes at points where the water at the higher level would escape into adjoining watersheds. These various dykes, also the dams, are plainly shown in the accompanying map.

The various quantities involved in the above mentioned works are estimated to be as follows:

Common excavation	24,000 cu. yds.
Rock excavation	13,000 cu. yds.
Concrete	52,000 cu. yds.
Earth fill (dykes)	78,500 cu. yds.
Iron and steel (reinforcing)	510 tons

Land Expropriations

About ten square miles of land will be flooded out by the raising of the water level; consisting partly of arable land and partly bush land. This will necessitate buying the affected property which will vary in value according to its accessibility and productivity. Bush land is comparatively cheap but arable land in good districts is much more costly, and a certain share of the total cost will be diverted to this purpose.

It is stated that 20 miles of roads will be affected by the raising of the water and these will be relocated and rebuilt at once, this work probably not being included in the main contract, but calling for a separate agreement.

Water Power Available on Both Streams

The Chicoutimi River has a total fall from Lake Kenogami to the Saguenay River of about 475 feet. This is an average head, as the tide effects the water level in the Chicoutimi River about 20 feet from low tide to high tide. Of this available head about 246 feet are being presently developed by the Chicoutimi Pulp & Paper Co. for industrial and municipal purposes. Price Bros. Ltd. have a site situated in the Town of Chicoutimi and at the present moment are building a new plant to give about 10,000 h.p. under a head of 70 feet. See "Contract Record," Feb. 14, p. 158. This plant is not yet finished and the output of 10,000 h.p. will not be obtainable until the new storage dams are built.

The Ausable river has a fall of 440 feet between Lake Kenogami and the Saguenay River. Price Bros. Ltd. are the only concern operating on this river and are at present using about 380 feet of this available head for their local purposes at Jonquiere and Kenogami.

Cost

It has been estimated that the total cost of the proposed work including expropriations and road diversions, will be in the neighborhood of 2½ million dollars.

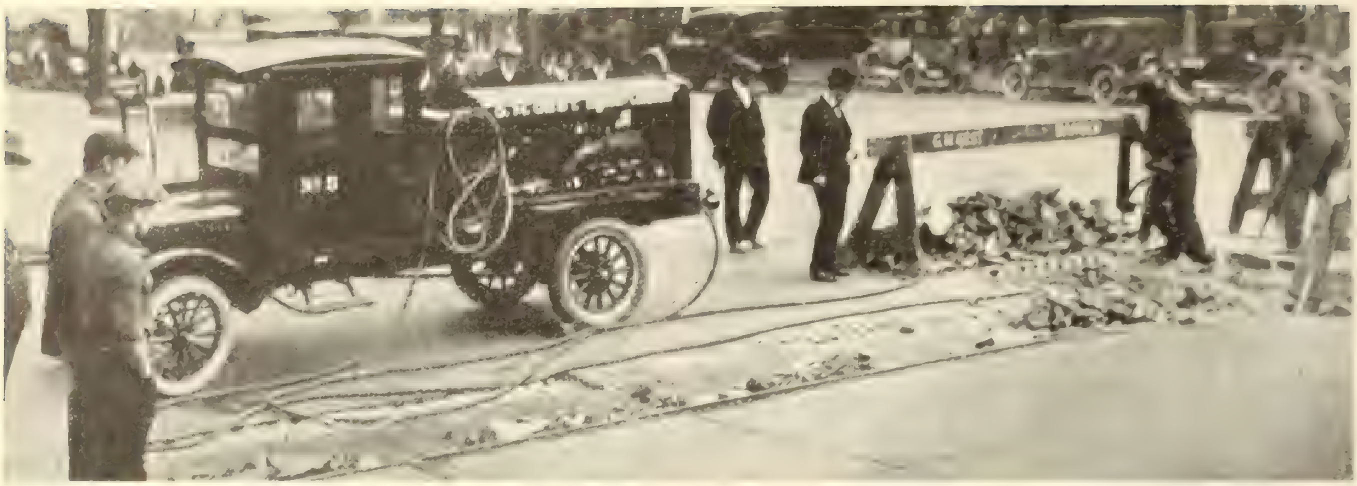
Some Impressions of the National Good Roads Show in Chicago

Perhaps no better summing up of the 1923 American Road Builder's Association good roads show at Chicago has been heard than that voiced by the perspiring man who, after a complete tour of the exhibits, stopped and gasped: "Well, road building is no longer just a pick-and-shovel job—this show proves it; and the best part of it all is that a fellow can see the whole works and make his choice right here!"

That that fervid booster was right was amply proved by the facts and figures. There were more than 200 exhibits, and the registered visitors exceeded 6,500. The show was a gripping climax to a tremendous, concentrated effort on the part of the American Road Builders' Association and the manufacturers of good roads machinery.

The most modern road-building equipment and labor-saving devices were in evidence. There were backfillers, clamshell buckets, cableways, industrial cars and track, conveyers, locomotive cranes, crushers, graders, mixers, locomotives, pavers, plows, scrapers, rollers, steam, electric, and gasoline shovels, sprinklers, sweepers, a variety of tractors, wagon loaders and unloaders, motor trucks and special bodies, paving and surfacing materials, etc., etc. The exhibits of several state highway departments and the extensive and wonderfully planned display of the United States Bureau of Public Roads all added to the educational value of the show, and made it plain that both local and national experts thoroughly believe in and support the work.

One particularly noticeable feature was the marked increased part played by the products of the manufacturers of pneumatic machinery. Six companies exhibited air compressors; and all of those displayed were of portable types mounted on wheels. This was due, no doubt, to the steadily widening favor which compressors of this sort are winning among road builders. Several of the larger manufacturers also displayed air-driven tools for the drilling of rock, for the cutting of pavements, for the digging of soil, and for other services. In fact, one organization, in



New Ingersoll-Rand portable air compressor at work on Montreal street

order to make its exhibit outstandingly convincing, made a point of showing its machine in actual operation.

Every hour or so, the hall would echo with the rapid blows of a "hammer" drilling into a block of granite, or there would be heard the less noisy action of a clay digger cutting out stiff clay upon which an old-time spade would not make a mark. In short the skeptical could see for themselves and even run the tools if they so desired; and this served on many occasions to dispel any lurking doubt regarding speed records and the performances of claimed for the equipment.

The past few years have witnessed the development of a large number of new or special pneumatic tools for highway work; and many of the visitors saw for the first time striking proof of what has been done to advance the art of "compressed air for the road builder."

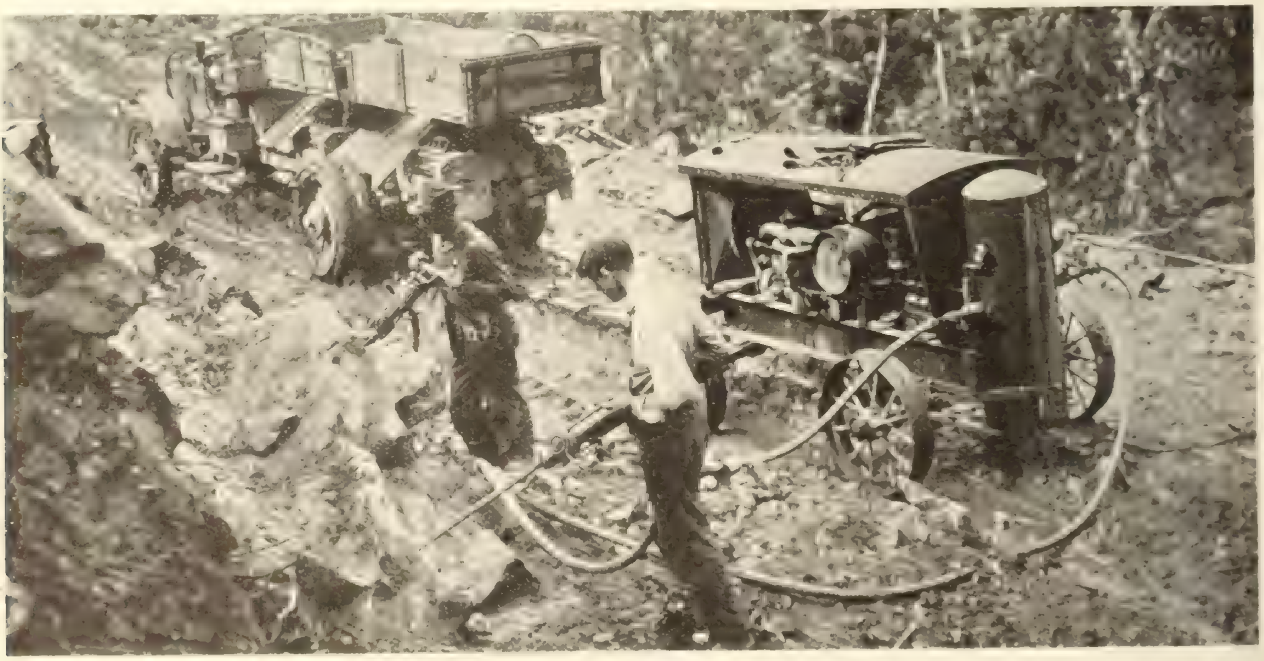
The Ottawa Cut Stone Works are moving their plant on 135 Nelson Street to their other location on Isabella Street. The consolidated management is under the personal supervision of Mr. B. Blackwell.

Machinery & Equipment

One of the features of the Ingersoll-Rand exhibit at the recent Good Roads show in Chicago was a unique portable air compressor outfit mounted on a Ford chassis. Until the appearance of units of this type, small jobs, requiring anywhere from ten minutes' to a day's time, were often necessarily performed by hand because it was seldom a paying proposition to haul a standard portable compressor to the work. For larger tasks, the outfits on wheels or those mounted on trailers sufficed; but short jobs involved placing one of these compressors on a heavy truck, which would have to stand idle frequently. An equipment of this sort is expensive to run and to maintain.

G. M. Gest, Limited, Montreal, was one of the first contractors to adopt this new light type in Canada and is using the equipment at present for digging and breaking out frozen ground.

The value of a smaller unit—one of sufficient capacity to operate a single "Jackhamer" rock drill, or



The portable outfit used for rock excavation two paving breakers, or several rivetting or chipping hammers—is appreciated after observation. Take, for example, the tearing up of paving during manhole repairs or the diging of a small section of trench in making pipeline repairs. Work of this sort ought to be done with all practicable dispatch; and while this is in hand at one place service of a similar sort may be required in another section of the city, perhaps five or ten miles away. With an outfit like the Ford portable it is necessary only to crank up, to tell the operators to hop aboard, and to be off to the other job as fast as the law allows.

The complete, portable, air compressor plant is built in a way to facilitate its mounting on a standard Ford chassis with a minimum of assembly work. The compressor is supported by a steel base, and the outfit is covered by means of a sheet-steel canopy having removable steel doors. In securing the compressor on the truck chassis it is not necessary to drill any holes in the frame or to alter the latter in any way. The plant consists of a 2-cylinder vertical compressor, direct-connected to a 4-cylinder, 4-cycle, tractor type of gasoline engine, a radiator and fan for cooling the water for the compressor and the engine, an air receiver, a fuel tank, and other essential accessories There are also supplied several tool boxes which are attached to the steel compressor frame. These are used to hold the rock drills, paving breakers or other pneumatic tools. One of the accompanying illustrations shows the simplicity of the get-up of this outfit. Light, sheet-steel doors completely enclosed the compressor plant when in transit or while idle, thus protecting it from dust or the weather.

A similar equipment is provided for electric motor drive. An arrangement of this character is found to appeal strongly to those electric light and railway companies that have standardized current conditions.

How Can Enough Skilled Men be Obtained?

The Labor Shortage Problem is One that Demands Urgent Solution—What the Labor Committee of the Associated General Contractors Recommend After an Investigation of the Situation

In addition to the usual problems attending the labor question, during the past year, industry, and more especially the construction industry, has been hampered by a most acute shortage in both skilled and common labor. This shortage was not peculiar to any particular section of the country, but was almost nation wide. In some sections the shortage was so acute that large projects were abandoned on account of it. The Associated General Contractors' Committee on Labor in attempting to ascertain whether there was a real shortage or whether the abnormal demand for labor caused by the great building program was responsible, and if there was a real shortage what the prime causes were, undertook an investigation of the subject, which revealed some very interesting and startling facts. Extracts from the report follow:

Two major causes appear as mainly responsible for this condition:

(a). The main factor for the great decrease in these occupations is undoubtedly the cutting off of immigration first by the War, and since by the restrictive legislation, as it has been a recognized fact that a very considerable proportion of the recruits to the trades has, in the past, been supplied by the incoming foreigners.

(b). Another and even more serious isolation, as it has been a recognized fact our young men are not learning these trades. Our investigations of the apprenticeship question revealed the fact that in every trade the number of apprentices was less in 1920 than in 1910, without any allowance for the increased number necessary to keep the ratio even with the increased population of the country. In the case of the bricklayers, plasterers and carpenters the number of apprentices was less than 50 per cent of the number of mechanics dying or retiring on account of old age.

Your committee while not contending that immigration and the insufficient number of apprentices is wholly responsible for the inadequate supply of mechanics does believe that they are prime factors and that their proper regulation and development would in great measure correct the situation.

The committee has given considerable study to the apprenticeship question and in the light of information gathered concluded that the old system of apprenticing young men was no longer practical as a means of training a sufficient number to replenish our supply of mechanics. The situation resolves itself into two problems, the first to provide, as quickly as possible, mechanics to supply the present shortage. The second to provide means for the education of mechanics in lieu of the present apprenticeship system.

To assist in solving the first problem, we recommend:

(a). That men now engaged on construction work as building laborers and otherwise, who show an aptitude, be employed as helpers to the skilled mechanics, being permitted to do any work their experience warrants. In a short time they could execute much of the plain work, releasing the older and more skilful mechanics for the most intricate work.

(b). That there be established by employers, under their control, special trade schools where the age limit and scholastic requirements be waived, and the only conditions for entrance be an aptitude for and a willingness to learn a given trade. These schools should teach merely the handling of tools and the rudiments of the trade, leaving skill and efficiency to be acquired on the job, where experience has shown it is most successfully acquired.

Keeping Pace With County's Growth

The second problem is to provide means to insure a supply of mechanics to care for the normal growth of the country. To do this all building trade organizations and persons interested in the construction business, should inaugurate a campaign to attract young men to the trade, showing how interesting, profitable and honorable mechanical vocations are. Educational officers should be urged to establish courses to teach the building trades, having in charge men who have had actual experience at the trade in addition to theoretical knowledge.

Trade unions should be induced to revise their rules regulating apprentices. Under the present rules it is impossible to interest either the youth or the employer. Under these rules, apprentices are limited to boys between the age of 16 and 20 years. It is well known that few American boys have any serious intention to learn a trade. Only after they have reached their majority do they look on life seriously and realize the necessity of having some trade.

The length of time required for apprentices is from two to four years. This is too long to teach the rudiments of a trade and is longer than a young man is willing to work for the wages an employer can afford to pay for the kind of work apprentices are permitted to do. Because of this limitation on the scope of employment, the boy's wages are small. His whole outlook is limited—quite naturally, he is discouraged—and he quits the job. General utility work would expand his knowledge and the experience, make him a more all-around useful mechanic to both the employer and himself.

Many schools for the practical teaching of mechanical trades have been started by employers in different parts of the country. Reports from the cities state that the schools are popular and that they are expecting no difficulty in securing all the students their facilities will accommodate. We will gather and publish reports of the success of these ventures as rapidly as we secure them.

With the Concrete Pipe Manufacturers

A Report of the Recent Annual Meeting of the American Concrete Pipe Association—Abstracts of Committee Reports, Papers and Addresses

Sixty of the leading manufacturers of concrete sewer and culvert pipe and drain tile attended the annual convention of the American Concrete Pipe Association held in Chicago on January 18 to 20, 1923. The attendance at the special session on the afternoon of January 19 was over eighty including a number of prominent engineers from many sections of the country.

Over twenty prominent manufacturers of drain tile, principally from Minnesota, Iowa and Wisconsin agreed on certain changes in the standard specifications for drain tile of the American Society for Testing Materials. In order to keep pace with the progress in manufactcre, it was thought desirable to make these changes, thus assuring the consumer of better grades of tile. At a meeting of Committee C-6, Drain Tile, of the American Society for Testing Materials, held in Chicago, January 19, these changes were acted on favorably.

The Culvert Pipe Committee of the Association met and discussed the recent report of the Joint Concrete Culvert Pipe Committee, which has under preparation standard specifications for railroad and highway culvert pipe. The Joint Concrete Culvert Pipe Committee consists of two representatives each of the American Concrete Institute, American Association of State Highway Officials, American Railway Engineering Association, American Society for Testing Materials, American Society of Civil Engineers, Bureau of Public Roads, U. S. Department of Agriculture and the American Concrete Pipe Association. Dean Anson Marston of Iowa State College, representing the American Society for Testing Materials is chairman. The secretary of the American Concrete Pipe Association is also secretary of this committee. Considerable progress was made at the meeting of this committee which was held on January 20 in Chicago.

Improvement in the Industry

The convention was formally opened by President A. N. Shearman the afternoon of January 18 and his address was, as usual full of enthusiasm and dealt largely with the work that has been accomplished by the Association during 1922. He described the history of the Association, advising that it was first organized in 1903 at Ames, Iowa, as the Interstate Cement Tile Manufacturers' Association.

Mr. Shearman emphasized the important work that has been carried on by the Association from a national standpoint, particularly the work that has been carried on in connection with committees having under preparation specifications for drain tile, sewer and culvert pipe. One of the most significant phases of his address was the optimistic outlook for the industry in the years to come. The industry took the greatest stride forward in 1922 of any year of its history. The concrete pipe manufacturers are selling their product on its merits and he emphasized the fact that pipe producers have made rapid progress in improving the quality of their product to meet the most exacting engineering requirements.

Following are extracts from an address by Mr. Ernest F. Bent (president and manager of the California Glazed Cement Pipe Co., Security Building, Los Angeles, Calif.).

"At the outset I want to say that I am becoming more and more sold on the proposition of the value of this American Concrete Pipe Association. Individually, we could not hope in a thousand years to accomplish what we are collectively not only able to do but are doing. The annual report of the Secretary shows not only great progress in the general building up during the past year, but also considerable evidence that much has been done in actual, positive accomplishments in sales and adoption of specifications in new cities, which leads to sales. Not only is it possible for achievement collectively that is not possible as individuals, but I know we are all feeling very keenly the positive value of co-operation among the members by the interchange of ideas and experiences from standpoints of both production and marketing.

"Every one of our plants has testing equipment. Maybe we are foolish. We may be crazy on the subject of testing, but this means one can keep a line on the product turned out. You often find things that surprise you. Often in testing, you find that your own product is not doing what you thought it was."

Mr. N. A. Epps (Gulf Concrete Pipe Co., Houston, Tex., was requested to describe his experiences in developing the concrete pipe business in southeastern Texas. Mr. Epps advised that not only the city of Houston, but surrounding towns have opened their specifications to machine concrete sewer pipe Mr. Epps described many humorous incidents where his competitors have attempted unsuccessfully to prevent the progress of the concrete pipe industry in his territory.

Roy H. Allison, (Consulting Engineer, Minnesota Concrete Pipe Manufacturers' Association, Mankato, Minnesota,) described the work that has been carried on by his organization in 1922. Mr. Allison paid special tribute to the work of Mr. Dalton G. Miller, representing the U. S. Department of Agriculture in Minnesota. Specimens of tile are frequently sent to St. Paul where Mr. Miller has his headquarters and tests are made approximately free of charge to the manufacturers. This work, according to Mr. Allison, has had a tendency to improve the quality of tile being manufactured in the state of Minnesota and the responsible manufacturers of concrete drain tile are co-operating with Mr. Miller to the fullest extent.

Mr. S. A. Swanson, (vice-president, Mid-State Construction Co., Hastings, Nebr.) described the development of the concrete culvert pipe business in Nebraska. He emphasized the importance of testing concrete culvert pipe, not only for the protection of the consumer, but for the protection of the responsible manufacturers. He related the experience of his company when the State Highway Department of Nebraska in 1922 required that every plant furnishing pipe for state work should install suitable testing equipment. Prior to this time, according to Mr. Swanson, he was positive that the pipe his company was producing would meet the most exacting requirements, but he found however, that it was often running as low as 10 per cent under the requirements. By studying the data published by the Structural Materials Research Laboratory on the control of water in concrete mixtures, his company was able to produce pipe of a much greater strength without additional cost. The step by the State Highway Department also put a stop to the irresponsible manufacturers of concrete culvert pipe, who have been responsible for the very few failures that have occurred in Nebraska. Mr. Swanson advised that approximately 75 per cent of the culvert pipe sold in Nebraska during 1922 was reinforced concrete.

Professor D. A. Abrams and Mr. Stanton Walker, his associate engineer, (Structural Materials Research Laboratory, Chicago) presided at a special session devoted to manufacturing problems on the morning of January 19. This session was especially well attended and pipe manufacturers were able to get first-hand information on the important work that is being carried on by the Structural Materials Research Laboratory which is under the direction of Prof. Abrams.

On the afternoon of January 19 an open session was held and attended by many prominent engineers of all sections of the country. Dean Anson Marston of Iowa State College, who is also vice-president of the American Society of Civil Engineers, delivered an address on the vast experimental work that has been carried on under his direction. His talk dealt largely with the performance of pipe under various loading conditions in different classes of soil. As heretofore mentioned, Dean Marston is chairman of the Joint Concrete Culvert Pipe Committee. He is also chairman of the Committee on Drain Tile and a member of the Committee on Sewer Pipe of the American Society for Testing Materials.

Mr. Langdon Pearse (Sanitary engineer of the Sanitary District of Chicago and senior member of the firm of Pearse, Greeley, and Hanson, Chicago) described the engineering developments of the Sanitary District. He described some of the larger sewers that have been built which range in size from 6 feet to 23 feet in internal diameter. He described with illustrations the various methods of disposing of sewage in the district, which has had such an important bearing on the development of Chicago. After his address, which was necessarily of a general nature, he was asked questions regarding the performance of concrete for sewer construction. He advised that the sanitary district of Chicago receives alternate bids on different types of construction, generally monolithic concrete and brick. As concrete construction is usually from 10 to 20 per cent cheaper than brick, the district has used concrete almost exclusively for building its comprehensive system. He also related the outstanding advantages of concrete from a structural standpoint. He advised that analyses of the sewage of Chicago and vicinity have always shown a slight alkaline reaction, and to his knowledge no harmful trade wastes have been encountered that could be expected to affect concrete of good quality. He related, however, one instant where improper ventilation and construction had caused the disintegration of a sewer above the flow line. He stated, however, that any class of construction would have been affected by this extreme condition.

Centrifugal Pipe Manufacture

Mr. W. G. Chase (president of the Canada Lock Joint Pipe Ltd., Toronto, Ont., formerly chief engineer of the Greater Winnipeg Water Supply District, Winnipeg, Man.) described with illustrations various water supply lines that have been constructed by the Lock Joint Pipe Co. He described the centrifugal method of making concrete pipe which has recently been introduced in this country. His company has recently secured two jobs in which this class of pipe will be used, one at Greeley, Colo., requiring 18,000 feet of 27 inch pipe and at East Orange, N. J., requiring 8,000 feet of 20 inch pipe. He also advised that his company has recently secured a contract for the Spavinaw Water supply Line at Tulsa, Oklahoma, requiring 52 miles of 54 and 60 inch reinforced concrete pipe. Mr. Chase also described the various expansion joints that were patented by his company which are used in the construction of water supply systems. Pipe are usually produced in 12 foot lengths in order to minimize the number of joints.

On the morning of January 20, the Business Session was held to discuss plans for 1923. It was unanimously agreed to continue the policy of promoting concrete pipe on its merits and to continue to encourage the manufacture and sale of the highest grade products possible.

President A. N. Shearman was re-elected by unanimous vote. The re-elected vice-presidents are: Ernest F. Bent, (president and manager, California Glazed Cement Pipe Co., Los Angeles, Calif.); A. M. Hirsh, (president, Lock Joint Pipe Co., Ampere, N. J.); Harry Cain, (Minnesota Pipe and Tile Co., Mankato, Minn.).

New members of the executive committee are as follows: C. H. Bullen, (Concrete Pipe Co., Board of Trade Building, Portland, Oregon); G. G. Robinson, (Independent Concrete Pipe Co., Harbor Administration Building, Toronto,

G. E. Warren was re-elected treasurer and M. W Loving, secretary.

Heavy Oil Engine an Economical Power Producer in Certain Instances

By S. H. EXCELL*

The fact that the heavy oil engine has a definite field is sometimes overlooked. There is also some misconception as to its suitability for a varied load. In the following article Mr. Excell clears up these points, backing his statements by figures taken from an operating plant.

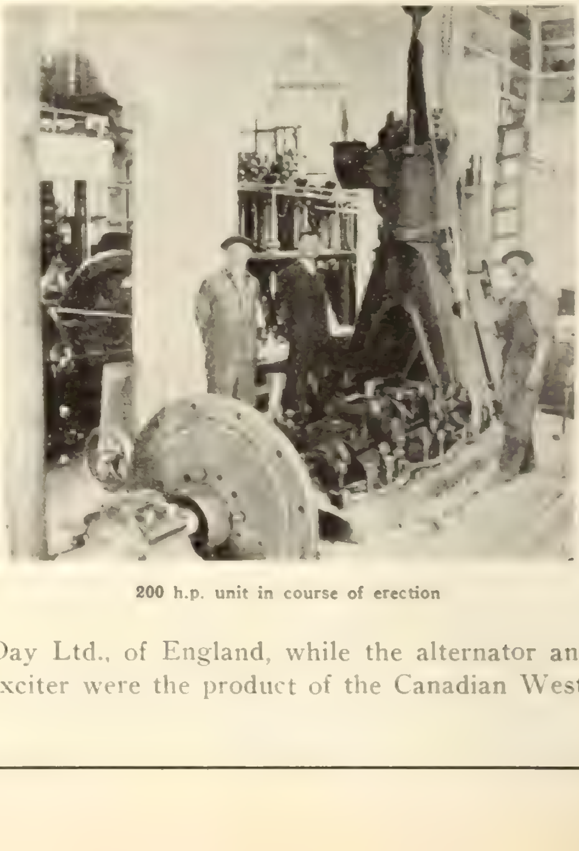
The power house, Vernon, B.C.

The use of the heavy oil engine has not been as general in Canada as might be expected from such a highly efficient prime mover. Engineers are apt to minimize the use of Diesel type engines in cases where a fair analysis of conditions might give the oil engine a preference. It may be pointed out that marine development in this direction has been particularly successful and it is now common practice to instal marine engines of from 2,000 to 6,000 horsepower, while engines of 10,000 horsepower are in growing demand.

The requirement for land use has resolved itself, so far, into use of units of some 750 to 1,000 horsepower, mainly for electricity supply, pumping water, sewerage, etc., where the governing condition is variation in demand. A well selected group of Diesel engines is ideal in this one respect at least for the average sized electrical undertaking, since machines may be cut in on the line as load conditions demand and at very short notice. It is quite possible to have a Diesel engine started cold and on the line in the short space of one minute.

A Successful Oil-engine Plant

The following is a rather brief description of a successful medium-capacity electric supply station in the coast province. This plant is situated at Vernon, B.C., and is owned and operated by the municipality. It has been in continuous operation since 1911, when a 200 h.p. Diesel engine, direct-coupled to alternator and exciter, was installed to augment the capacity of the steam driven plant. The engine was manufactured by Messrs. Mirrlees, Bickerton & Day Ltd., of England, while the alternator and exciter were the product of the Canadian West-



200 h.p. unit in course of erection

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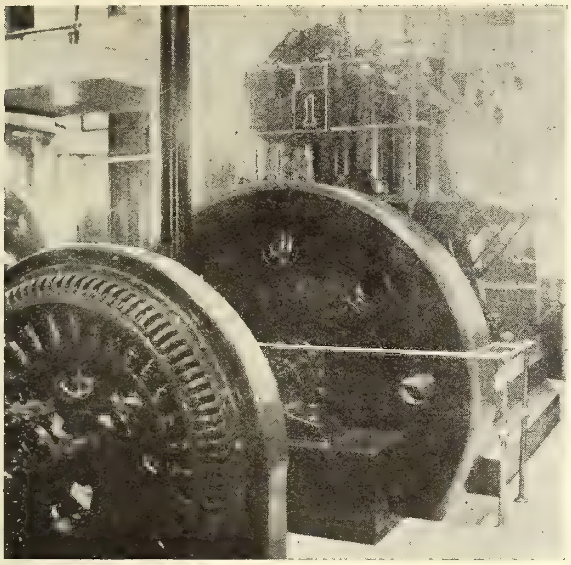
*City Superintendent, Vernon, B.C.

inghouse Company. The system operates at 2,300 volts, 3 phase, 60 cycles.

In 1913 extensions became imperative and the economy and reliability of the oil engine were so pronounced that the steam plant was shut down entirely and a 525 h.p. "Polar" type Diesel engine, built in Sweden by the Atlas Diesel Engine Co., installed. This engine is direct connected to a 375 k.w. alternator supplied by the Canadian General Electric Co. These units gave entire satisfaction until load conditions again warranted extensions to the station capacity. This extension took the form of another 200 h.p. unit, by the Mirrlees Co., which is direct connected to its alternator of 175 kv.a. rating, built by the Canadian General Electric Co. The switchboard originally supplied by the Canadian Westinghouse Co. was extended to suit the added unit and a Tirrill voltage regulator installed, to take care of any combination of machines.


200 h.p. unit showing generator

Low Maintenance

During the chaotic conditions of the war period, the plant operated continuously and not till 1922 was it found possible to raise the crankshafts of the first two units and generally carry out a complete overhaul. Beyond re-alignment of main bearings, no heavy replacements were found necessary.

In operation, the lubricating oil is passed through the engine bearings, heated by steam generated in a jacket heater surrounding the exhaust pipes, filtered through a De Laval oil purifier and then stored in a battery of Burt oil filters. This method results in the use of not more than 50 gallons of fresh oil per month for a plant capacity of 925 h.p.

The station is hot water heated, the main source of heat being the water-jacketed exhaust silencer of the 525 h.p. unit. For boosting or standby purposes a small sectional boiler is installed, while the circulation in the heating system may be boosted by a 2 h.p., motor-driven, centrifugal pump, making it independent of temperature or head conditions.

Readers of the Contract Record may be interested in our operating figures for 1922 and I append herewith the copy of my department report for the period January 1 to December 23, 1922—practically a year:

City of Vernon Power & Light Plant

Capacity of plant, 765 kv.a. (Units, 175,175,415).

Output as metered at switchboard	1,167,166 kw.h.
Output as metered to consumers	750,436 kw.h.

Analysis of output:—
Light, 326,968 or 28%, heating, 258,931 or 22.2%, power, 164,537 or 14.1%, City utilities, 154,230 or 13.2%.

No. of services metered	1280.
Line losses	22.5%
Load factor	22.6%
Kw.h. consumption per capita	359
Fuel used	92,000 gals.
Cost of fuel	$10,120.00
Average cost per gallon	11.0c.
Average cost per kw.h.	.86c.
Average overall cost per kw.h.	4.72c.
Average return per kw.h.	4.86c.
Average cost of generation, (at switchboard)	3.448c.
Average cost of distribution	.272c.
Total expenditure on service	$55,147.31
Total revenue from service	$56,749.00
Surplus over expenditure	$1,601.93

Capital value of plant.—
Power plant, $108,777.56, Distribution System, $65,000.00.

Average fuel consumption	.709 lbs. per kw.h.
Fuel Consumption on Peak	.424 lbs. per kw.h.

Note:—Trend of fuel and general supplies is upward for 1923.

It may be asked by some, what is the life of a Diesel engine. This is not easily answered. The various working parts can all be replaced by duplicates, since the construction of these engines is very highly standardized. It therefore follows that an engine may be completely renewed in all parts and be as good as new 25 years after it has been installed. Cases may be cited in England and Europe where engines installed 25 and 27 years ago are still giving continuous and economical service. From the above outline of Diesel engine performance, when new plants or extensions are to be considered, it may be shown the use of oil engines may not lightly be passed over as of small account.

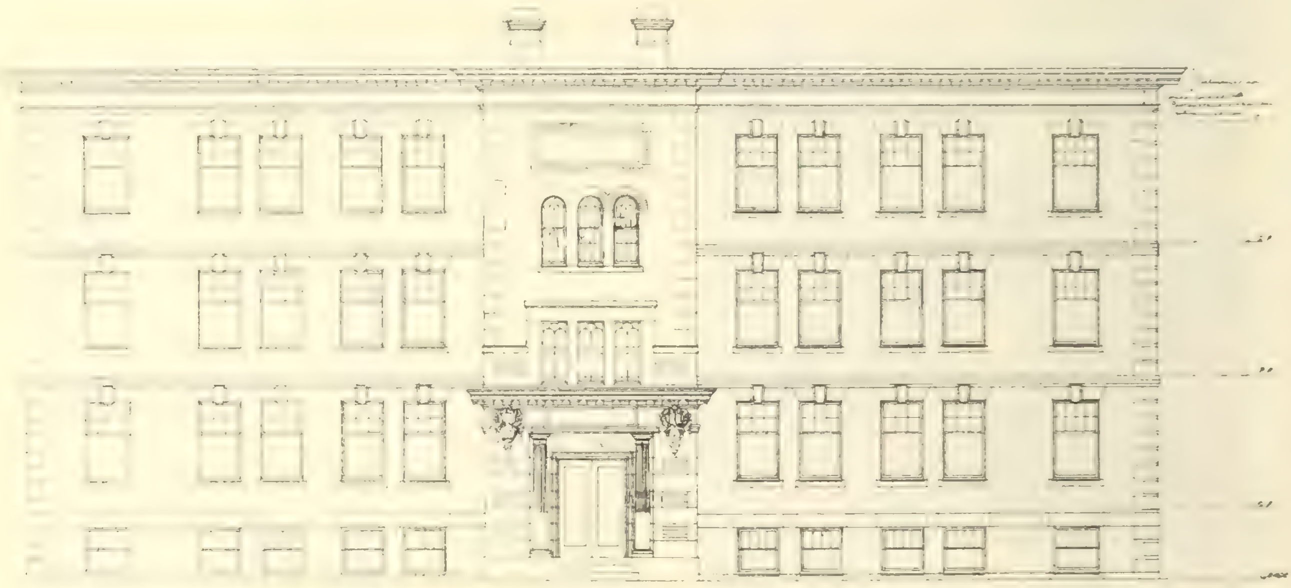
The Contract Record's

Weekly House Suggestion No. 57

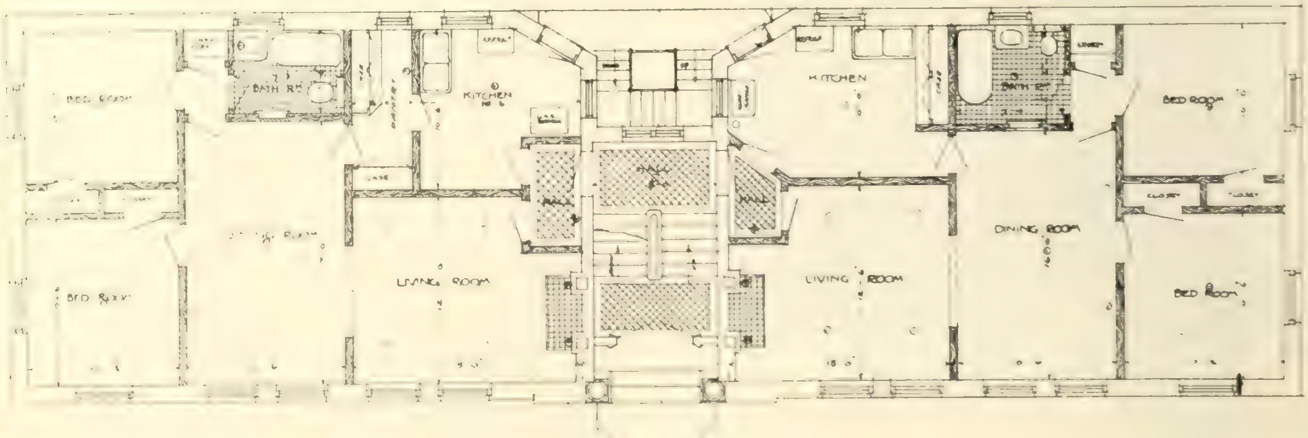
Our suggestion this week is a small apartment building, erected recently in Toronto. A glance at the elevation conveys the impression that this building is larger than it actually is. It was constructed on a wide but shallow lot and the architect, in designing a structure for this peculiarly shaped lot, has secured very satisfactory results in the layout of rooms, as a glance at the reproduced plan illustrates.

The construction is of dark red face brick and stone is used in the window and main entrance trim. Each floor is divided into two suites of five rooms and the basement contains one five-room suite and janitor's quarters and heating plant. The upper floors are laid out exactly the same as the ground floor, plan of which is reproduced herewith. There is very little variation between the layout of the two suites as shown in this plan; in fact the only difference is in the kitchen and bathroom arrangements. The rooms are all of good size, the dining room being exceptionally large for an apartment suite. The flooring throughout is of oak and the trim is birch, stained mahogany. The living room in each case is equipped with a neat brick fireplace and the dining room has a mock beam ceiling. As seen on plan, there is an open iron staircase from basement to roof in the open court at the rear of the main hall; this can be used as an emergency exit. There are entrances on the janitor's quarters in the basement from the left side of the building and from the open court at the rear.

This interesting apartment building was designed by Mr. J. W. Siddall, architect, Confederation Life Bldg., Toronto.



EAST ELEVATION



GROUND FLOOR

Mainly Constructional

East and West—From Coast to Coast

Thirty members of the St. John branch of the Engineering Institute of Canada paid a fraternal visit to the Applied Science Department of the University of New Brunswick recently. In addition to the visiting engineers those present at the meeting, which was held in the University Library, included the applied science students, members of the engineering profession in Fredericton and others interested. Four papers on engineering subjects were read by members.

Strong agitation is under way to have the Niagara boulevard, which now extends from Fort Erie to Queenstown, run directly through to Niagara-on-the-Lake. The municipalities interested are taking the matter up with the Commission, and also the Ontario Government, contending that such a move would establish direct communication between Lake Erie and Lake Ontario. The Park Commission has promised to give the matter consideration.

Major J. H. Brace gave a very interesting address on the construction of the Gouin Dam on the St. Maurice River, at a recent meeting of the Engineering Institute of Canada, at Montreal. The talk was illustrated with a number of excellent slides, several depicting the peculiar difficulties, particularly those of transportation, experienced by the engineers in the working out of this subject, due chiefly to its location in a wilderness fifty miles distant from the National Transcontinental line.

At a recent meeting of the Halifax branch of the Engineering Institute of Canada, Mr. J. F. Paige, Operating Manager of the Halifax Shipyards, gave a very interesting lecture on "The Development of Shipbuilding."

The Protestant Board of School Commissioners at Montreal plan a new Public school for the Cote Ste. Paul district, to cost $250,000, and a fifteen-room addition to the Rosemount school for construction this year. This work is in addition to the completion of work at present under way and the usual program of repair work at the various schools.

With a view to promoting building activity in Oshawa, Ont., the local Board of Trade at a recent meeting unanimously passed a resolution favoring a sale of town debentures to enable the Housing Commission to construct several houses.

An agreement regarding the width of provincial highways entering Toronto has been reached between the city authorities and the government, a width of 60 ft. being decided upon.

Fire completely destroyed Howlett's brick and tile plant at Petrolea, Ont., recently. The fire started in the dryer and spread to the whole plant, with the exception of the office. The damage is estimated at between $8,000 and $10,000. The company have signified their intention of rebuilding at once.

A delegation composed of representatives from various public bodies of Niagara Falls, Ont., waited on the government at Ottawa recently, advocating the canalization of Chippawa River by placing a dam at Montrose and raising the level of the river and have freight boats come through from the new Welland Ship Canal. Hon. G. P. Graham, acting Minister of Railways and Canals, promised that the matter would receive the consideration of his department.

A recent report states that the contract has been let by the United Gas and Fuel Company for the erection of a $2,500,000 by-product coke oven plant at Hamilton. It will give employment to 250 men and will be located on a 35-acre site on the bay front. It will be the only plant of its kind in Canada. In addition to gas, coke will be produced.

A recent report from Amherst, N.S., states that notices have been sent to the shoreholders of the Robb Engineering Works for a meeting to be held in Montreal February 21 to consider the winding up of the company. President G. H. Duggan stated that the net result of the operations for the year ending December 31 was a deficit of $89,000.

It is stated that the business men of St. Clair district, Toronto, have opened negotiations with large hotel syndicates for the establishment of a 1,000 room apartment hotel on St. Clair Ave. It is felt that a building of this type is required in this district, there being no structure of this kind at present in this large district of 100,000 population.

Personal

Mr. J. W. B. Blackman, engineer of North Vancouver, B.C., resigned recently. His resignation will take effect on April 30. Until a new official is appointed, the work will be carried on by Mr. John McCredie, recently appointed works foreman.

Mr. F. B. Goedike, of Toronto, was recently appointed township engineer of York Township, Ont., and will assume his duties in a few days. Mr. Goedike is at present occupying the situation of resident engineer on tunnel sewer work at Hamilton. He was born at Toronto and is a graduate of Queen's University.

Obituary

Captain H. C. C. Walkem, M.C., only son of J. B. Walkem, K.C., and a graduate of the Royal Military College, Kingston, died in Gananoque, Ont., recently after a brief illness. Capt. Walkem, who since the war had been an engineer with the Department of Public Works, Ottawa, had been on survey work near Gananoque. When the great war broke out in 1914, he was appointed to the Royal Engineers, Imperial Army, with the rank of second lieutenant. He served in France with the R. E.'s, where he rendered distinguished service, being mentioned in despatches for bravery, later being awarded the Military Cross and receiving promotion to the rank of captain.

Trade Incorporations

Crystalite Stone Products, Ltd., with head office at Hamilton, capital $50,000, to carry on a quarrying and stonecutting business.

Fireproof Door Co. Ltd., with head office at Toronto, capital $100,000, to manufacture fireproof doors and other fireproof products.

John Lucas & Co. Ltd., with head office at Toronto, capital $150,000, to manufacture and deal in builders' supplies.

Innes, Lawrie, Ltd., with head office at Toronto, capital $100,000, to carry on a general contracting and engineering business.

Alex. Murray & Co. Ltd., with head office at Montreal, capital $40,000, to manufacture and deal in various chemicals, including paving pitch, tar, creosote roofing, etc.

Plankstone Co. of Canada, Ltd., with head office at Peterboro, Ont., capital $200,000, to carry on a general construction business. The principals are G. A. Gillespie, 447 Homewood Ave. and P. P. Westbye, 21 Dennistown Ave., Peterboro.

CONSTRUCTIONAL ACTIVITY

Period of Feb. 14 to Feb. 20, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Brantford, Ont.
I. P. Adams, City Engineer, will call for tenders shortly for cement, asphalt, sewer pipe, asphaltic road oil, castings and hardware, for road maintenance.

Bruce Co., Ont.
$220,000 will be expended this year by the Council on the maintenance of roads and bridges.

Casselman, Ont.
In May the Town Council will lay a cement sidewalk costing $1,000.

Eastview, Ont.
Laying 6" watermains on two streets contemplated by the Town Council. A. Guibalt, Mayor.

Elora, Ont.
Town Council plans to spend about $25,000 on new pavements. Udney Richardson, reeve.

Essex, Ont.
Waterworks extensions are proposed by the Town Conucil. Building of a reservoir in connection with improvements is contemplated.

Hamilton, Ont.
City will widen York St. Work will proceed when land is expropriated. S. H. Kent, clerk.

Suburban Roads Commission, Court House, contemplate the following road improvements near Hamilton: Barton St. E., from city limits, $3,000; Garth St., $1,000; King St. E. from city limits, including small bridge, $11,000; Fennel Ave., $3,000; Beach Road, $1,000. Sec.-treas. Mr. Vance. Work will be carried out this year.

Levis, Que.
Provincial Department of Roads will receive tenders on macadam road, Levis-St. Lambert Highway, until Mar. 7.

Moncton, N. B.
Concrete sidewalks costing $15,000 contemplated by the city. J. Edington, engineer.

Montreal, Que.
The enlargement of an aqueduct at a cost of $1,000,000 including the construction of reservoirs and filtering basins is contemplated by the City Council. S. Fortin, engineer.

Ottawa, Ont.
Work will start shortly on laying of concrete sewers on several streets at a cost of $36,000. A. F. Macallum, Works Commissioner.

Pembroke, Ont.
Plans are being prepared by Town Council for a roadway costing $90,000. Asphaltic concrete, 5,600' long, 28' wide; curbs and gutters. J. P. Howe, engineer and L. S. Barrand, Chairman of the Commission.

Prescott Co., Ont.
County Council contemplates roadwork costing $20,000. Work will commence in May.

Sault Ste. Marie, Ont.
Public Utilities Commission contemplates an extension to sewers costing $1,600. W. M. Cornell, 81 Great Northern Rd., manager.

Southampton, N. B.
The Provincial Government Department of Public Works contemplates concrete arch culverts and a road diversion in York County.

Stamford Twp., Ont.
Sewers costing $200,000 are proposed by the Township Council. M. Kerr, Township Hall, Niagara Falls, engineer.

Sunny Brae, N. B.
Town Council contemplates a sewerage and waterworks system. H. Cambert, clerk.

Wentworth Co., Ont.
$15,000 will be spent on the Waterdown Road S., by the Suburban Roads Commission. Mr. Vance, secretary.

CONTRACTS AWARDED

Brantford, Ont.
Toronto Brick Co., Sun Life Bldg., Toronto, has the contract for 8,000 pressed brick for Belleville pumping station.

Coteau Station, Que.
Fraser & Chalmers of Canada Ltd., 285 Beaver Hall Hill, Montreal, supplied the pump for the $10,000 aqueduct and pipe line being built by the G. T. Rly.

Montreal, Que.
The general contract for the Sherbrooke Highway has been awarded to Lizotte & Dansereau, Ham Sud. G. Henry, Parliament Buildings, engineer.

Ottawa, Ont.
Dominion Lock Joint Pipe Co., Harbor Commissioners Bldg., Toronto, have the contract for pipe for sewers costing $36,000.

Prescott Co., Ont.
Cloutier & Grenon, Casselman, have been awarded a contract for road work for $2,500 by the County Council.

Railroads, Bridges and Wharves

Ailsa Craig, Ont.
Town Council and G. T. Rly. contemplate a subway. C. Forrester, G. T. R. Offices, London. superintendent.

Carlisle, Ont.
Suburban Area Commission, County Court House, contemplate a bridge and sidewalk. Councillor P. Ray, Waterdown, interested.

Fredericton, N. B.
Canadian National Railways are pr paring plans for a five stall roundhous Chief Engineer, A. F. Stewart, Moncton, N. B.

Grand Forks, B. C.
The building of a 3½ mile tramway from Grand Forks to McAllister is contemplated by the Slogan Star Mines Ltd., at cost of $35,000. R. A. Grimes General Manager.

Hamilton, Ont.
Dominion Power Transmission Co. contemplates track extensions. Alderman Bert. Burrell. interested.

Herbertville, Que.
A concrete bridge is contemplated by the Municipal Council. Tenders are being received by J. C. Hudon, secretary, until Mar. 5.

Jackfish, Ont.
C. .P. Rly., Montreal, contemplate a coaling plant. Mr. Fairbairn, engineer.

Lachute, Que.
The rebuilding of bridges in the Lachute Sub-division is contemplated by the C. P. Rly., Montreal. Mr. Fairbairn, engineer.

Megantic, Que.
Coaling plant contemplated by C. P. Rly. Mr. Fairbairn, Head Office, Montreal, engineer.

Paisley, Ont.
Bruce County Council contemplate rebuilding a bridge near Paisley at a cost of $12,000. G. A. Stevenson, Walkerton, Ont., engineer.

Quensel, B. C.
The Provincial Government contemplates the building of a traffic bridge across Canyon Creek costing $9,000. Henry Whittaker, Parliament Buildings, Victoria, architect.

St. Apolline, Que.
A frame bridge costing $1,500 proposed by Council. E. LeBland, secretary.

St. John's, Que.
Steel water tank contemplated by the C. P. Rly., Montreal. Mr. Fairbairn, engineer.

Saugeen Twp., Ont.
Tenders wanted until March 2 on a steel and cement bridge by the Township Council. F. W. Elliott, clerk, Port Elgin, Ont.

Wotton, Que.
Tenders will be called by the Town Council on a concrete and iron bridge. Sec.-treas., T. Gervais.

Westmount, Que.
A subway is contemplated by the C.

P. Rly. Mr. Fairbairn is Chief Engineer.

Public Buildings, Churches and Schools

Argyle, Man.
$12,000 addition to building contemplated by the Brant School District. F.

Belleville, Ont.
Bulk tenders for artificial stone, masonry, carpentry, roofing, metal sash, glazing and sheet metal will be received until March 5 on the extensions to Albert College. Chapman & Oxley, Harbor Commissioners' Building, Toronto, architects.

Eastview, Ont.
Dominion Government contemplate a Post Office. R. C. Desrochers, Parliament Buildings, Ottawa, secretary.

Egmont Bay, P. E. I.
The time for receiving tenders on the Roman Catholic Church has been extended until Mar. 10. Rev F. X. Gallant, priest.

Fort William, Ont.
Plans for an addition to the operating room and nurses home of McKellar General Hospital are being prepared by R. E. Mason, Victoria Building.

Gaspe, Que.
Public hall costing $5,000 contemplated. Rev. Mr. Wayman interested.

Grand Valley, Ont.
School Section of East Luther receiving bulk and separate tenders on a school until Feb. 23. Wm. Henry, R. R. No. 1, secretary.

Hull, Que.
City Council contemplates building a large fire station. Mr. Tessier, chief.

Maple Ridge, B. C.
The School Board is having plans prepared for an addition to the school costing $7,000. T. Davidson, chairman.

Montreal, Que.
The parish of St. Saviour will rebuild a church destroyed by fire at a loss of $150,000. Rev. J. A. Mosseau, 471 Lagauchetiere St. W., interested.

Ottawa, Ont.
Tenders for reinforced concrete shell, brickwork, masonry and carpentry for Service building of $2,500,000 hospital will be received by the Chairman of the Board until Mar. 7th.

Alterations to the Police Station contemplated by the city will include the installation of new plumbing and heating systems.

Quebec, Que.
Redemptorist Fathers contemplate finishing the interior of a private chapel. H. Laberge, 103 St. John St., architect.

Richmond Hill, Ont.
On Feb. 10 ratepayers passed a bylaw authorizing the expenditure of $100,000 on a High School. Architect not yet appointed. Dr. R. Langstaff, chairman of the Board.

St. Charles, Que.
S. Rene Richer, 240 Girouard St., Montreal, is preparing plans for a $125,000 church for the parish and will call tenders about Apr. 1.

St. Hyacinthe, Que.
Elevators in the $700,000 hospital being built by the Grey Nuns are being installed by Otis-Fensom Elevator Co., Montreal.

St. Victor, Que.
Board contemplates a school. Secretary-treasurer, J. E. Vielleux.

Sault Ste. Marie, Ont.
Plans are being prepared for a nurses home to cost about $35,000. Findlay & Foulis, 527 Queen St. E., architects.

Spalding, Sask.
W. E. Tyler is chairman of Community Association which contemplates a $5,000 hall. Plans are being prepared.

Steinbach, Man.
School District No. 65 will call for tenders soon on a two storey school costing $7,000.

Thessalon, Ont.
The Public School Board contemplates a High School costing $30,000. A. J. Cooper, secretary.

Three Rivers, Que.
Plans are being prepared for a $30,000 school by Chas, Lafond, Alexandre St., for the Roman Catholic School Commission. Tenders will be called shortly.

Victoria, B. C.
Provincial Government is preparing plans for jails at Abbotsford, Campbell River and Lucerne to cost $5,000 each.

J. C. M. Keith, Sayward Bldg., is preparing plans for a Synod Hall costing $80,000.

Woodstock, Ont.
An addition to a school contemplated by the City at a cost of $100,000. H. A. Little, President of Board of Management.

CONTRACTS AWARDED

Charlesbourg, Que.
Nap. Barbeau, 36 Bridge St., Quebec, has the roofing contract and J. Tardivel, 120 Abram Hill, Quebec, the painting contract for the $125,000 novitiate.

Chutes-de Shawinigan, Que.
Ovila Filion, & Frere, 2985 St. Dennis St., Montreal have the general contract for the church.

Grey Twp., Ont.
The Trustees of S.S. No. 10 have awarded Mr. Easerman of Broadhagen the general contract for a school.

Grimsby, Ont.
R. Moxley has the general contract for the installation of hot water heating in the fire hall.

Ottawa, Ont.
Ottawa Bowling & Tennis Association, 3rd Ave., have let contracts on their $20,000 Club House as folllows: Electrical, S. Lewis, 63 Metcalfe St.; plastering, Murphy and Morrow, Billings Bridge.

Quebec, Que.
Contracts on the addition to "St. Malo" convent let as follows: Carpentry and masonry, Magloire Cauchon, 307 Richardson St.; roofing, E. Falardeau, 141 Dorchester St.; painting, B. Vaillancourt, 92 Sauvageau St.; plumbing, Fortunat Gringras, 34 St. Augustan St.; electrical, P. P. Guguere, 56 des Fosses St.

St. Ambroise, Que.
Church and Sacristy costing $89,000 being erected by the parish. Rev. M. J. Gagnon, curate. L. H. Gaudry & Cie Ltee., Chicoutimi, have the general contract.

Toronto, Ont.
Ebsary Gypsum Co., Temple Bldg., have the contract for gypsum roofing for the repair shop and storehouse being built by Toronto Transportation Commission. Deslauriers Metal Column-Forms, H. A. J. Aldington, 53 Yonge St. Arcade.

Business Buildings and Industrial Plants

Delaware, Ont.
Tenders on a business block for the Delaware Masonic Lodge are being received by Dr. W. M. Brice.

Dresden, Ont.
Cliff. Morrison is interested in prices of materials for a $50,000 flour mill. Plans are being prepared.

Hamilton, Ont.
Sement-Solway Co., Syracuse, N. Y., who have the general contract for a $2,500,000 coke oven and gas plant for Hamilton By-product Coke Oven Co., will commence work shortly on this plant and let all contracts in Canada.

Tenders on a $30,000 printing plant will be received until Feb. 24 by Warren & McDonnell, Home Bank Bldg.

L. Rosenblood, 372 Ottawa St., plans to proceed with the erection of a $15,000 store and dwelling in March. Prices on all materials wanted.

Work has just started on alterations to a building for offices. Commercial Properties Ltd., c/o Sparks & Mackay, 9 Fairholt Rd. S., general contractors, are the owners.

Mercantile Trust, 11 Main St., E., will make alterations to a building to the extent of $15,000. H. Arnold, 52-23rd St., architect.

Foundations are in for store and apartments costing $9,000 for D. B. Hamilton, Main St. E.

Wingham Weave Works, Lorilla St., will build a $9,000 addition to their factory. G. E. Mills, 614 King St. E., is the general contractor.

Next summer Wentworth Dairy Co., 165 St. John St., contemplate building an addition to their plant.

McClary Mfg. Co., York St., will make additions to their factory costing $7,500.

Ham Sud, Que.
A creamery is contemplated by J. A.

Menard & Frere, St Adolphe de Dudswell, Que. Work may proceed shortly.

Kitchener, Ont.
Store and apartment costing $20,000 contemplated by J. Bullas, 30 Joseph St.

London, Ont.
Plans are being prepared for a store and apartment costing $25,000 by A. E. Nutter, 110 Dundas St.

Montreal, Que.
Tenders for a departmental store for Dupis Freres will be called for shortly. A. Surveyer & Co. and H. F. Labelle, 915 Drummond Building, engineers.

Mount Dennis, Ont.
Henry Jordan, 2 Yeatman's Rd., has purchased a site on which he proposes to build stores and apartments.

Electroplax Mfg. Co., York Bldg., Toronto, have decided not to erect the proposed building.

Ottawa, Ont.
C. J. Burritt, Hope Chambers, is preparing plans for a business block for C. R. Stephen.

$6,000 laundry contemplated by Oblate Fathers, Ottawa East.

Port Alberni, B. C.
C. J. V. Spratt, Rockland Ave., Victoria, will commence work at once on a saw and shingle mill and wharf which will cost about $250,000.

Quebec, Que.
H. Laberge, 103 St. John St., is preparing plans for an addition to a building owned by L. P. Turgeon, 103 St. Foye Rd.

Langlois Ltd., St. Paul St., planning to make extensive alterations to their building which includes freight elevators, offices and sample rooms. H. Laberge, 103 St. John St., architect.

St. Hyacinthe, Que.
Tenders will be called about Mar. 7 for a $12,000 office building for L'Union St. Joseph. S. R. Richer, 240 Girouard St., Montreal, architect.

Ste. Marguerite de Beauce, Que.
Fortunet Audet will commence work in April on a store costing $6,000

Seaforth, Ont.
Seaforth Clothing Co., F. G. Neelin, interested, proposes additions to a factory.

Toronto, Ont.
Maple Leaf Milling Co., Dominion Bank Bldg., contemplate a warehouse in the west end but have not yet definitely decided when work will commence.

J. McClure, 138 Roehampton Ave., is building a store and apartment costing $17,000.

Separate tenders for mechanical trades and bulk tenders for all other trades will be received by N. A. Armstrong, 7 King St. E., on $750,000 office building for H. L. Bowles.

Tillsonburg, Ont.
Factory costing about $40,000 contemplated by the Norfolk Shoe Co. Ltd. L. C. Van Greel, superintendent.

Westboro, Ont.
Standard Bread Co. Ltd., Hillson Ave., contemplate a factory.

CONTRACTS AWARDED

Hamilton, Ont.
Monarch Metal Co., Main St. W., are rebuilding a factory and have let the general contract to S. J. White, 165 Main St. E.

London, Ont.
The general contract for the $15,000 plant for Orange Crush Bottlers Ltd., has been awarded to John Hayman & Sons, 432 Wellington St., London.

T. F. Jones, 167 Church St., St. Catharines, has the general contract for an office and warehouse for Fleishman Yeast Co.

The electrical contract for a branch for Canadian Bank of Commerce has been awarded to S. Lewis, 63 Metcalfe St.

Powell River, B. C.
The general contract for the first unit of the steam plant for the Powell River Co. has been awarded to Hodgson, King and Marble, London Building, Vancouver.

Toronto, Ont.
Additional contracts on the Ford assembly plant have been let as follows: Plumbing, Long & Edwards, New York. c/o F. Rich, 213 Westmoreland Ave., Toronto; sprinklers, Automatic Sprinkler Co. of Canada Ltd., 26 Victoria Sq., Montreal.

Sheppard & Abbott, 119 Harbord St., have the contract for plumbing in the addition to the Harris Abattoir Plant.

The $50,000 factory of the Independent Concrete Pipe Co., Harbor Commissioners Building, is being wired by Windsor Electric Co., 102 Bond St.

Contracts for alterations to the Bell Telephone Building on Adelaide St. have been awarded as follows: Steel, Dominion Bridge Co. Ltd., Imperial Life Bldg.; heating and plumbing, Mechanical Trades Co. Ltd., 54 University Ave.; marble, J. G. Gibson Marble & Granite Co. Ltd., 52 Winchester St.

Plastering contract let to R. C. Dancy, 57 Kendall Ave., and painting contract let to Drummond Bros., 540 King St. W., for $15,000 alterations to Holden Co's. offices.

Windsor, Ont.
Foundations are going in for a store and flats costing $15,000. Parker & Manning, 107 Janette Ave., have the masonry contract.

Contracts on wash house and storage for the British American Brewery Co., Sandwich and Bruce Sts., have been awarded as follows: Plastering, Troup Bros.; glazing, C. M. Bennett.

Residences

Hamilton, Ont.
Plans are being prepared for an apartment house costing $50,000 by Geo. E. Mills, 614 King St. E.

Blatz Bros., 66 King St. E., will start work shortly on a $5,000 residence.

Fourteen residences contemplated by Bethune & Dirks, 187 Ottawa St. N., in addition to those previously reported.

Islington, Ont.
George Michie is building a $7,000 house for W. J. Stephens.

London, Ont.
Plans and estimates will be secured A. E. Welch, 452 Queens Ave., for a 4 family flat costing about $15,000.

Montreal, Que.
Tenders will be called shortly by T Gauthier, 1129 St. Hubert St., for a apartment house. D. E. Painchaud, 21 Chatham St., architect.

Mount Dennis, Ont.
Four residences costing $5,000 each proposed by John Brickwood.

Niagara Falls South, Ont.
A $5,500 residence is contemplated by Donald R. Gill, Falls View.

Ottawa, Ont.
G. Conley, 173 Coburg St., has had plans drawn for a solid brick apartment house to cost $30,000.

Point Grey, B. C.
W. A. Logan, 1349 Nanton St. will build a $8,000 residence.

Saskatoon, Sask.
Tenders are wanted, no closing date set, by R. M. Thompson, architect, for a $13,500 residence.

St. John, N. B.
Ten residences costing $50,000 are contemplated by Armstrong & Bruce, 103 Prince William St. Work will proceed in April.

St. Laurent, Que.
J. A. Grou, Monkland Blvd., is building a $6,000 residence for Edison Reed of Toronto.

Toronto, Ont.
Five bungalows, costing $6,500 each, will be built by Hillcrest Land Co. Ltd., 1481 Queen St. W., this spring.

E. G. McBride, 129 Glenmount Pk. Rd., is excavating for a pair of residences costing $8,000.

W. L. Sommerville, 45 Bloor St. E., will revise plans for a $12,000 residence for J. E. Ferguson, 8 Colborne St.

Foundations are in for a $10,000 bungalow for A. Mills, 100 Inglewood Drive. Wilson & Willmott are the architects and general contractors.

Several residences costing $5,000 each are contemplated by Geo. E. Petrie Ltd., 67 Winchester St.

J. Carroll, 292 Kennedy Ave., is excavating for four bungalows costing $28,000.

Jas. G. Murphy, 82 Dominion St., is building a residence costing $7,500.

C. P. Button, 64 Orchard View Ave., will shortly call tenders on a $6,000 residence.

Burk & Co., 18 Toronto St., are excavating for a $12,000 residence. Tenders for all trades being received until Mar. 1.

Vancouver, B. C.
Residence costing $9,000 will be erected by C. H. Fraser, Fairfield Building. Gardiner & Mercer, Birks Bldg.

Four suite apartment costing $9,500 to be built by E. Sleeman, 1386-11th Ave. W.

Verdun, Que.
U. Proulx, 411 Gordon Ave., contem-

plates 4 flats costing $9,000. Work will probably proceed in March.

J. Bonin, 225 Lasalle Rd., is building a brick residence costing $6,000.

H. Lafrance, 407 Rielle St., is excavating for a residence to cost about $8,000.

Windsor, Ont.
L. D. Galloway, 357 Windermere Ave., is excavating for a double residence to cost about $8,000.

Peter Osterhout, Exchange Building, is excavating for a residence to cost $7,000.

Winnipeg, Man.
A residence costing $9,000 proposed by C. T. Lount, Union Bank Bldg., who will purchase all materials and let subtrades.

CONTRACTS AWARDED

Montreal, Que.
Contract for wiring an apartment house costing $25,000 has been awarded by the Mutual Realty Construction Co. to F. Neyrinck, 802 De Gaspe St. Henderson & Fils, Lachine, are the general contractors.

J. & O. Montpetit, 1517 Verdun Ave., have awarded the contracts on flats costing $10,000 as follows: M. Marchessault, brick; J. Labelle, roofing; S. Quensel, electrical; N. Dulude, plumbing; Aubertin & Cie, plastering; sash and doors, J. P. Dupuis.

Outremont, Que.
The electrical contract for three residences costing $18,000 each has been awarded to F. Neyrinck, 802 De Gaspe St., by J. C. Julien, 783 Lacombe St., builder.

Verdun, Que.
Contracts on 12 flats costing $22,000 have been awarded by J. Legault, 63 2nd Ave., owner, as follows: M. Raymond, brick; J. Labelle, roofing; M. Forget, electrical; C. Malchelosse, plumbing; O. Aubertin & Cie, plastering; sash and doors, V. Varin.

Power Plants Electricity and Telephones

Campbellville, Ont.
Ratepayers passed the by-law authorizing a lighting and power distributing system. Work will go ahead in the spring. R. C. Menzies, chairman.

Clifford, Ont.
Estimates on a new electric lighting system to be secured by the Town Council. J. R. Aitchison, clerk.

Thorold, Ont.
Public Utilities Commission proposes a new switchboard, generator and transformer at a cost of $5,000.

Miscellaneous

Esquimalt, B. C.
Time has been extended for receiving tenders on dry dock machinery for the Dominion Government. R. C. Desrochers, Parliament Buildings, Ottawa, will receive tenders until March 15.

Kingsville, Ont.
Bath house and pavillion costing $5,000 contemplated by counucil. Robert Black, secretary.

London, Ont.
Boss & Brazier, 703 Waterloo St., will open for business as general contractors about April 1 and will need equipment.

Moncton, N. B.
An oil distributing plant contemplated by Canadian Oil Co. Ltd., St. John. Cost will be about $50,000.

Montreal, Que.
Belmont Construction Co. recently incorporated with a capital of $500,000. The Atlas Construction Co., 37 Belmont St., interested.

Ottawa, Ont.
Tenders for 185 water meters are being received by the Board of Control. Commissioner of Works, A. F. Macallum.

Tillsonburg, Ont.
Installation of a hot water heating system in the Town Hall and Municipal Offices is contemplated by the Council.

Toronto, Ont.
F. B. Goedike, 38 Humberside Ave., has received the appointment as engineer of York Township.

Toronto Cement Corporation recently formed will carry on business as

Subscribers' Information Service

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The "Contract Record" receives many letters from subscribers inquiring where certain building or engineering materials, supplies, equipment, machinery or apparatus can be obtained or disposed of.

In order to adequately and promptly serve our subscribers in this respect we have organized a special department to handle such requests for information.

This SUBSCRIBERS' INFORMATION SERVICE is at your disposal free of charge. Should you wish a certain machine or certain engineering or contracting equipment, supplies, etc.—ask us.

No inquiry is too small—we aim to make this service of practical and definite value to every reader of the "Contract Record." It is yours to use whenever occasion arises.

List below each item on which you want particulars, whether it be building or engineering materials, supplies, equipment or machinery. Mail to "Contract Record," 347 Adelaide St. West, Toronto.

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Firm Name ....

Address ....

Date........... Inquirer's Name ....

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

Tenders Wanted

Sealed tenders, marked Tender, and addressed to the undersigned, or to John A. Huey, County Clerk, Sarnia, will be received up till 12 o'clock noon of **Wednesday, March 14th, 1923,** for the furnishing of all material, erection and completion of a 150′ centre to centre bearings,

18 ft. Roadway Bridge

known as [illegible] Bridge over Bear Creek on 6-7 S.R. Con. 5, Moore Township, Lambton County.

Tenders may be for the abutments and floor, for the Steel work, or for the entire work of the Bridge.

Plans and specifications may be examined at the office of George A. McCubbin, County Engineer, Chatham; or John A. Huey, County Clerk, Sarnia; or John McCallum, County Road Supt., Alvinston, Ontario.

All tenders must be accompanied by a marked cheque for 5% of the amount of tender and the name of an approved Guarantee Company.

Lowest or any tender not necessarily accepted.

Dated at Alvinston, this 12th day of February, 1923.

JOHN McCALLUM,
8-10 County Road Superintendent.

City of Brantford

Tenders for 1923 for

Road Oil, Asphalt Cement, Castings, Cement and Sewer Pipe

Sealed tenders addressed to Ald. C. S. Moyer, Chairman of the Board of Works, care of City Clerk, Brantford, Ont., will be received until 12 o'clock noon on

Thursday, March 8th, 1923

for the supply of Road Oil, Asphalt Cement, Castings, Cement and Sewer Pipe, required by the City of Brantford during 1923.

Specifications may be seen and Form of Tender obtained on application to the City Engineer. Each Tender must be accompanied by a marked cheque payable to the City Treasurer for the amount called for in Form of Tender.

The lowest or any tender not necessarily accepted.

FRANK P. ADAMS,
City Engineer.

Brantford, Ont., Canada
February 15th, 1923.

RATES

20 cents per agate line (14 lines to the inch) Positions Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

Tenders Wanted

Sealed tenders, addressed to H. W. Ackerman, Secretary of the Building Committee, Belleville, and marked "Tender for Albert College" will be received up to twelve o'clock noon,

Monday, March 5th, 1923

for Masonry, Artificial Stone, Carpentry, Metal Sash and Glazing, and Roofing and Sheet Metal work for the new Albert College at Belleville, Ontario.

Plans or specifications may be seen at the office of the Architects at any time and all necessary information may be obtained by applying to them.

Tenders received after the time above stated will not be considered and the Owners reserve the right to reject any or all tenders submitted; contract not necessarily awarded to the lowest bidder.

CHAPMAN & OXLEY, Architects,
Harbour Commission Bldg.,
8 Toronto.

DEPARTMENT OF ROADS

TENDERS

Lovis-St. Lambert Highway, Parish of Ste. Angele-de-Laval

Tenders made on forms supplied by the Department of Roads and placed under envelopes bearing the words: "Tender—Levis-St.-Lambert Highway, parish of Ste. Angele-de-Laval," shall be received at the office of the Minister of Roads in the city of Quebec, Government Building, up to one o'clock of the afternoon, on

Wednesday the Seventh (7) of March, 1923

for the oil macadam of the Levis-St.-Lambert Highway in the municipality of Ste. Angele-de-Laval, in the county of Nicolet. Length 30,406 feet.

The Government of the Province of Quebec does not bind itself to accept any of the tenders.

Quebec, February 13th, 1923.

J. L. BOULANGER,
8-9 Deputy Minister.

To Contractors and Others

There will be sold by Public Auction at the Town Hall, Cayuga, Ont., on the 3rd day of March, 1923, at two p.m. a valuable

Road-stone Quarry and Crushing Plant

on the Talbot Road, about four miles from Cayuga in the County of Haldimand.

For particulars and conditions of sale apply to Ludwig & Ballantyne, Continental Life Building, Toronto, Harrison Arrell, K.C., Caledonia, Ont., R. S. Colter, Barrister, etc., Cayuga 8-10

FOR SALE

Byers No. 3 Auto Crane, road wheels; 38 ft. boom; ½ yard Clam—capacity 350 yards per day, located Windsor. Specifications and terms apply Cadwell Sand & Gravel Co. Ltd., Windsor, Ont. 7-10

STEEL PILING

1000 tons 40′ long.
14″ x ⅜″ Arch Web.
7″ x ¼″ Straight Web.
All ready to load.
UNIVERSAL EQUIPMENT COMPANY,
1 T.f. Niagara Falls, Ont.

FOR SALE

Keystone Excavating Machine, complete with two sticks, skimmer scoop, and three ditching scoops; this machine has been used only one season and is guaranteed to be in first class condition. Price $4,500 f.o.b. St. John, N. B.

Austin Backfiller with caterpillar traction, 4-cylinder Buffalo engine, in equally good condition Price $2,500 f.o.b. St. John, N. B. Canada Lock Joint Pipe Limited, 65 Pleasant Boulevard, Toronto, Ont.; or St. John, N. B. 6-T.f.

FOR SALE

1 60 H.P. Waterous Locomotive Type Boil
1 40 H.P. Vertical Engine.
1 30 H.P. Vertical Engine.
1 25 H.P. Vertical Engine.
2 3″ - 2″ Steam Pumps.
1 60′ c to c belt elevator 26″ belt 24″ buck
1 24″ x 24″ Friction Hoist.
23 2 cu. yd. 4′ gauge Quarry Cars.
1 150 H.P. Erie City Steam Engine.
1 48″ Revolving Screen.
1 Traction Engine.
1 Feed Water Heater.
Several 6″ Steam Gate Valves.
2 Locomotive Air Pumps.

All above machinery can be seen at our plant, Hagersville, Ontario.

8-11 Hagersville Quarries, Limited

WANTED

Rent or buy—one small Dredge, on a small job. Suitable for dredging a small creek half yard dipper or smaller required. Reply to Bryson & Irwin, Wiarton, Ontario, Contractors 8-11

FOR SALE

Electric Travelling Cranes and Steel Crane Runways

STEEL CRANE RUNWAY—382 ft. long; height of columns 30 ft.; weight about 150 tons. Used for 15-ton Crane 80 ft. span.

1—CLEVELAND ELECTRIC TRAVELLING CRANE 80 ft. span; capacity 15 tons. At present in service on the above Runway.

STEEL CRANE RUNWAY—220 ft. long; height of columns 23 ft. Also 22 additional Girders each 20 ft., without columns, sufficient to extend Runway 220 feet additional. Total weight about 50 tons. Used for 7½-ton Crane 70 ft. span.

2—CLEVELAND ELECTRIC TRAVELLING CRANES—37 ft. span; one-15-ton capacity, and one 10-ton capacity, without Electrical Equipment.

Ask for prices and further particulars, also a complete list of our second hand machinery.

The Maritime Bridge Co., Limited
New Glasgow, Nova Scotia

6 T.f

A Service to the Profession

Every man wishing to tender must first see the plans and specifications.

If the plans are in Montreal and he is in Vancouver the inspection is a problem. We, however, with your assistance, are able to solve it. Place them on file at any or all of the offices of the "Contract Record" throughout the Dominion.

Contractors, engineers and allied manufacturers read the "Contract Record." It is the logical publicity medium for the announcement of tenders wanted.

Send us your plans. They will receive the best of care.

A room is reserved in each of our offices for examination of your plans by possible bidders.

Contract Record
and Engineering Review

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Montreal - - 119 Board of Trade Bldg.
Winnipeg - - - 302 Travellers' Bdg.
Vancouver - - - 106 Winch Bldg.

QUANTITY SURVEYOR Fully qualified in all branches of the profession open for engagement. Apply Box 120, Contract Record, Toronto. 6-9

GOOD BRICKLAYER foreman seeks position: Experienced in stone setting. Could take entire charge. Apply Box 134, Contract Record, Toronto. 7-8

GENERAL CONSTRUCTION SUPERINTENDENT, expert in reinforced concrete buildings, bridges, etc., open for position. Box 140, Contract Record, Toronto. 7-9

OPEN FOR POSITION as foreman or superintendent, 20 years experience concrete bridge and culvert, pile driving, coffer dam work. References if necessary. Will go anywhere. Box 495, Burlington, Ont. 7-9

WANTED—Position as draftsman for sewer design. One year sewer experience and six years at mechanical drafting. Ernest Jarrold, 139 Avondale Ave., Hamilton, Ont. 8-9

DRAFTSMAN WANTED for Brantford Architect's Office. Must be experienced in construction and detail work. State qualifications and salary required to Box 135, Contract Record, Toronto. 7-8

CONSTRUCTION SUPERINTENDENT with 15 years experience handling all classes of building and water work, wants position. A1 testimonial and guarantee results. Will go anywhere Box 147, Contract Record, Toronto. 8-10

May Build a Dry Dock

Construction of a dry dock to cost $400,000 has come up for immediate consideration at Dunfermline, Scotland. Burntisland, Kirkcaldy, and other town councils are in consultation over the matter.

Waterworks Construction Approved

An executive decree by the Uruguayan Government of November 28 approved the plans and estimates for the construction and exploitation by the National Sanitary Works of a sewage and waterworks system and an electric-light and power plant in the town of Concepcion del Uruguay, at an estimated cost of 4,787,959 paper pesos, 1 peso being worth $0.85 on January 9, 1922.

Build Motor Highway in Italy

Work is in progress on a special motor highway connecting Milan, Italy, with the lakes that lie within a radius of 50 kilometers of that city. A concession has been granted for building and operating the road through private subscriptions and municipal subsidies. A toll system later will provide maintenance. It is estimated that the total cost will be about 60,000,000 lire (1 lire=$0.0486 on January 9).

Street Railway Planned

Negotiations have recently been carried on between a committee appointed by the city of Tammerfors, Finland, and a certain firm for the construction of street-railway lines in that city. The city is to buy a minority of the shares and the railway is to revert to it within a period of 40 years. It is thought that the proposition will mature in the near future, as the city has previously granted about 1,000,000 Finnish marks (about $25,000 at present exchange) for the purpose.

Transportation Facilities Improve

During the year 1921 there was no development or extension of Chinese railways. Nor was there any considerable improvement in existing lines. At present there are 15,672 kilometers of railways in China, of which 3,830 kilometers are owned and operated by foreigners, 3,496 kilometers are owned by Chinese, with powers reserved by mortgages, 7,513 kilometers are under Chinese control with foreign accountants and foreign engineering staffs, and 773 kilometers are lines constructed locally or purchased from foreign concessionaires or owners.

There was considerable extension of highways during 1921, due to a large extent to the relief work extended by the American Red Cross. The mileage in China is estimated to have been increased many times during the year, and from what appears to be a reliable source it may be stated that there were approximately 1,588 miles of highways constructed in China, 490 miles under construction, and 3,876 miles projected at the end of 1921.

Portland Cement Industry in France

The French cement industry appears to have taken on a somewhat brighter aspect. Cement factories in the Boulogne district report improved demand, and in consequence the plants are working full time in anticipation of continued orders from England and Ireland. The reflection of the exchange situation in the price of coal has caused an increase in cement prices of 8 francs per ton. Latest quotations are 118 francs per metric ton plus 40 francs for sacks.

Important movements of cement are contributing to the general activity of the port. Large shipments have recently been made, and other loadings of considerable tonnage are under way for the west coast of Africa. Total shipments from Boulogne by water during October 1922 amounted to 9,986 tons.

Railways Consolidated

Consolidation of the New York, Chicago & St. Louis (Nickel Plate), the Chicago & State line, the Lake Erie & Western, Cincinnati & Louisville and theToledo, St. Louis & Western (Clover Leaf) was approved by the Boards of Directors of the five railroads, representing an authorized capitalization of $105,500,000 and operating 1,695 miles of road, W. A. Colston, vice-president and general council of the Nickel Plate stated.—

The directors of the roads in the consolidation, sometimes referred to as the "Van Sweringen Lines," approved and executed an agreement for the unification of the five roads into a single corporation to be known as "The Chicago & St. Louis Railroad Company," and directed submission of the agreement to meetings of stockholders of the several companies.

New Dry Dock For Belgium

The Belgian Government has approved the building of a new dry dock which will cost about 16,000,000 francs. The bids for this will be awarded within about two or three months and actual construction will begin immediately thereafter. This dry dock will be 210 meters (688 feet) long and 26 meters (85 feet) wide at entrance.

Proposed Public Works in Argentine

A proposal has been made for the Argentine Government to expend 4,500,000 paper pesos (1 paper peso=$0.37 on January 9) in the construction of a series of public works, the funds to be obtained by an increase in the budget estimates for public works. The most important items recommended are: Bridges and highways, 1,500,000 pesos; repair and new construction of school buildings, 500,000 pesos; and waterworks and drilling equipment, 500,000 pesos.

dealers and manufacturers in Portland Cement.

Fires

Sudbury, Ont.
Methodist Church destroyed by fire. Loss about $30,000. Rev. J. Cochrane, pastor.

St. Stephen, N. B.
Fire destroyed a business block owned by R. I. Young, and loss will be about $15,000.

Late News

Cayuga, Ont.
About Mar. 15 tenders will be called for an $85,000 Court House and Jail for Haldimand County. F. Barber & Associates, 40 Jarvis St., Toronto, architects. H. Arrell, Caledonia, clerk.

Fernie, B. C.
Tenders will be received by the secretary of Fernie High School Board until Mar. 6 for the proposed addition to the building costing $33,000.

Grand Falls, N. B.
Waterworks costing $35,000 are contemplated by the Council. John M. Keefe, solicitor.

Marbleton, Que.
L. B. Hill, Marbleton, contemplates an hotel to cost $18,000. Architect not yet appointed.

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FIDELITY AGENCY OF CANADA
THIRTY SIX TORONTO STREET

Port Colborne, Ont.
Hotel costing $35,000 contemplated by D. J. Higgon, who will endeavor to form a company and build this summer.

Prince Albert, Sask.
Work will start in the spring on the $150,000 addition to the jail. J. M. Smith, Regina, Deputy Minister of Public Works. M. W. Sharon, Parliament Buildings, Regina, architect.

Toronto, Ont.
Tenders will be called about Mar. 1, by the Suydam Realty Co., 36 Toronto St., on twelve residences costing $120,000.

Standard Home Builders, a recently incorporated company, will erect buildings and deal in building materials.

Wentworth Co., Ont.
Suburban Roads Commission, Court House, Hamilton, will make improvements to Mount Albion Road to the extent of $25,000 while $6,000 will be spent on Waterdown Road, N. Secretary is Mr. Vance.

Weyburn, Sask.
Tenders wanted by W. A. Mather, General Superintendent, C. P. Rly., Moose Jaw, on cast iron pipe. Tenders will be received until Feb. 26.

Belt Line for Detroit

A proposal to build a railroad around the city of Detroit with the object of relieving transportation congestion, has been laid before the Interstate Commerce Commission by the Detroit Grand Belt Railroad Company, which sought authority to proceed with construction. The line would be 47 miles long and would run from Wyandotte via Dearborn, Pontiac and Utica to Mount Clemens. It was declared in the application that construction of such a railroad to intersect lines running into Detroit, was the only feasible method of giving Detroit efficient transportation service.

Brazilian Railway Notes

The Central Railway of Brazil has completed 25 kilometers of new track from Marinna to Ponte Nova, a short branch from Montes Claros (Minas Geraes), a bridge over the Sao Francisco River at Pirapora, and a station at Bella Horizante.

The Federal Government has authorized the construction of a branch line from Cotegipe to Passegem, for the West Central Bahia Railway. The cost is estimated at 1,688,916 paper milreis ($193,381, at exchange rate of $0.1145 on January 15, 1923) and 325,495 francs.

The Northeastern of Parana Railway has been authorized to extend its lines from Ourinhos on the Sorocabana line to Porto Itaipava on the Paranapanema River.

The completion of 903 kilometers of track between the Parana and Cuyaba, by the Sorocabana Railway, opens the port of Sao Paulo for the export of products of southern Matto Grosso. Exports of live stock from that State have already increased 70 per cent. The railway is now waiting for 300 additional stock cars and has ordered 200 flat cars.

The Government has authorized the State of Rio Grande do Sul to restore the telegraph lines of the Rio Grande do Sul Railway, to substitute 172,418 ties, to reinforce and rebuild metallic superstructures whereever necessary, and to make other necessary repairs. The cost of this work is estimated at 200,000,000 Belgian francs ($12,740,000, at exchange rate of January 15, 1923).

During the four years ended November 15, 1922, extensions totaling 1,197 kilometers have been made on 20 Brazilian railways. The major extensions are in the northeastern and central States, the longest being 284 kilometers from Sao Luiz to Caxias.

Norwegian City Plans New Bridge

The municipality of Bergen is inviting international competition in plans for a new bridge over the fjord which separates the heart of the city from Solheimsvik district. The new bridge is to replace an existing bridge which has become insufficient to accommodate the traffic. The bridge is a part of the main line of communication between the city proper and the outlying southern districts and a great part of the surrounding suburban and country districts. Seagoing traffic passes through the waterway which is to be spanned. The bridge is to be constructed with a movable section, and a double-track electric tramway is to cross it. Three prizes will be awarded—of 10,000, 8,000, and 6,000 crowns—and the judges are authorized to purchase as many as three plans at 2,000 crowns each. The city of Bergen will furnish, against a deposit of 50 crowns, full details of conditions of the competition, description of natural conditions, traffic, etc., plans, drawings, and photographs, in the English, German, or Norwegian languages; and, if desired, the Bergen consulate will take pleasure in securing and forwarding the same for interested Americans. All plans must be submitted on or before June 30, 1923.

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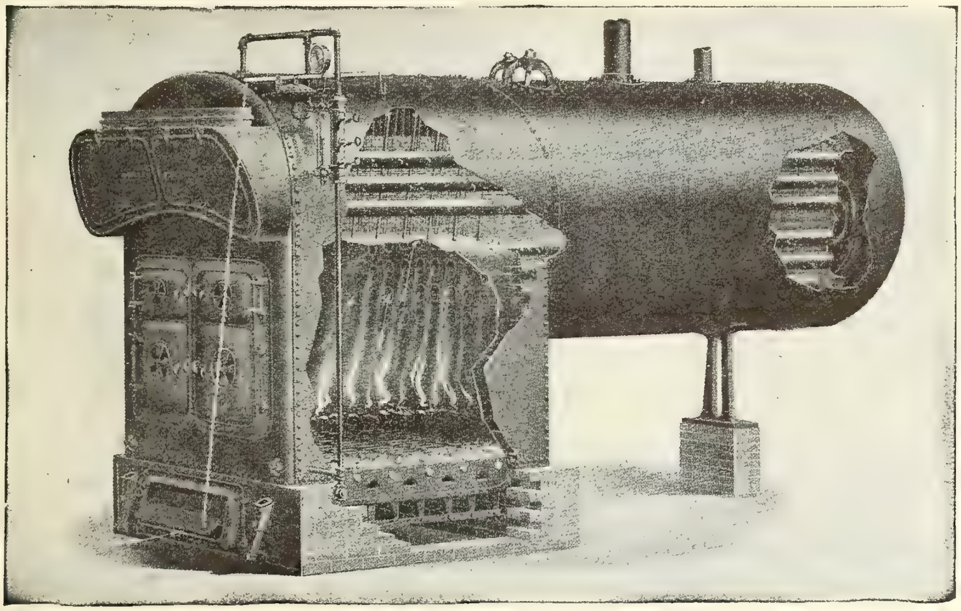

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Concrete Roads for Hakodate

Hakodate is the leading city in the northernmost island of Japan and heretofore has had unsatisfactory highways. A scheme has just been developed, involving an expenditure in excess of $2,000,000, under which it is proposed to pave about 1,200,000 square yards of street with concrete, 7 to 8 inches thick. It is anticipated that this road improvement scheme will require a few years for completion, but it is interesting to note that, in common with a number of the other more important cities in Japan, definite steps are to be taken for the improvement of the roads.

Lighthouse Rebuilt

The new lantern installed on the lighthouse on Serpents' Island, in the Black Sea, which is in the course of reconstruction, started functioning regularly on December 1.

The tower of the old lighthouse was built by the Russians in 1840, but no light was installed in it till 1856, when by the Treaty of Paris the island passed into the possession of Turkey. The lighthouse was under the administration of the Ottoman Government till 1879, and since then the European Commission of the Danube have been responsible for its maintenance and working.

The tower and buildings were bombarded and destroyed by the German cruiser Breslau on June 25, 1917, since then there has been only a small temporary light on the island. The reconstruction of the lighthouse was begun this year by the Commission. The tower has now been erected and the new lantern and apparatus installed.

Will Use Empire Materials

The Duke of Devonshire has written, on behalf of the management of the 1924 Empire Exhibition, to Sir Joseph Cook, Australian High Commissioner in London, undertaking that only Empire materials will be used in the construction of the exhibition buildings, and that only Empire products will be used in the exhibition restaurants. No exception will be made to this rule unless the British Exhibition authorities and representatives of the Dominion cooperating in the management certify that Empire products are unavailable.

Little New Work

Little construction work is being done in Chihauhau, Mexico, at present, and no new buildings are being erected. A contract has just been made for a $50,000 addition to Palmore College—a missionary school maintained by the Methodist Episcopal Church South of the United States. Shortage of equipment has hampered the traffic on the railroads that have been reopened, and increased rates and the order promulgated during the latter part of 1921 requiring prepayment of all freight charges have restricted unnecessary shipments.

Building Declines in Germany

Only one-eighth as many new buildings are being put up in Germany today as a year ago, according to reliable trade statistics. In December 458 new structures were reported, representing less than half the number registered the previous month. November's new buildings totalled one-fourth the registry during the same month last year.

Profit by the Experience of Sturtevant Sales-Engineers

The installation of a Sturtevant heating and ventilation system in your plant assures such uniform circulation of pure air throughout warm buildings as to speed production and increase efficiency.

We urge that you let Sturtevant sales-engineers quote specific economies in the operation of your buildings. What they have saved for others they can do for you. Send for Folder 606.

B. F. Sturtevant Company
of Canada, Limited
Montreal - Galt - Toronto

Sturtevant
PUTS AIR TO WORK

BULLETIN Nº 8

·BURLINGTON·STEEL·CO·LTD·

RAIL CARBON — REAL STRENGTH

·HAMILTON·ONT·

·4½·BILLION·VIBRATIONS

AND STILL THE BUILDING STANDS UP

IN SALT LAKE CITY, THE UTAH COPPER CO HAVE A BUILDING WHICH, ACCORDING TO THEIR ENGINEER, HAS BEEN VIBRATING A MILLION TIMES A DAY SINCE 1907.

IT CONTAINS OVER 600 SEPARATING MACHINES WHICH VIBRATE SO INTENSELY THAT AN ORDINARY INDIVIDUAL CANNOT STAY IN THE BUILDING

THERE ARE 1500 TONS OF RAIL-CARBON BARS USED IN THE STRUCTURE AND STILL EVERYONE IS SATISFIED.

YET SOME ENGINEERS WILL TELL US THAT A HIGH-CARBON STEEL BAR IS NO GOOD WHEN SUBJECT TO VIBRATION

THE UTAH COPPER CO., SALT· LAKE· CITY

A CERTAIN RAILWAY EQUIPMENT COMPANY HAS IN THE LAST 15 YEARS, MANUFACTURED AND PUT INTO SERVICE ON RAILROAD ROLLING STOCK. 3,210,000 PIECES OF RAIL-CARBON STEEL, ROLLED IN THE FORM OF U'S OR CHANNELS TO FORM BRAKE-BEAMS.

IN 15 YEARS THEY HAVE NEVER HAD A FAILURE

SURELY SUCH A RECORD IS WORTHY OF CONSIDERATION

IF A NAKED BRAKE-BEAM WILL STAND UP YEAR IN YEAR OUT UNDER HEAVY-DUTY SERVICE, CERTAINLY A BAR OF THE SAME MATERIAL WHEN EMBEDDED IN CONCRETE IS FOOLISHLY SAFE

IF THE MOTHER RAIL STANDS UP UNDER THE POUNDING AND VIBRATION OF THE LOCOMOTIVE, WHY SHOULD THE LITTLE BABY RAIL STEEL RODS IN THE CONCRETE GIRDER BELOW FALL DOWN?

THINK IT OVER

THEN SPECIFY RAIL-CARBON STEEL BARS ACCORDING TO A.S.T.M. SPECIFICATION A-16-14, AND YOU WILL GET THE STRONGEST, PUREST AND BEST STEEL

BULLETIN Nº 9 –·THE·MOTHER·RAIL.

Current Prices of Building and Engineering Materials

CEMENT (Delivered on job):—

		Toronto	Montreal	Winnipeg	Vancouver
Retail lots including bags	per bbl.	[illegible]	[illegible]	$4.80	$3.70
Car lots, including bags	per bbl.	3.35	3.48	4.16	3.35
Refund on bags	each	.20	.20	.20	

LIME (Delivered on job):—

		Toronto	Montreal	Winnipeg	Vancouver
Lump, in retail lots	per ton	14.30	14.00	.58 bu.	2.70 bbl
Lump, in car lots	per ton	12.70**	11.00	13.80 ton*	2.60 bbl
Hydrated, in retail lots	per ton	20.00	26.00	.60 bag*	30.00
Hydrated, in car lots	per ton	19.00	21.00	.54 bag*†	25.00

BRICK and TILE (Delivered on job):—

		Toronto	Montreal	Winnipeg	Vancouver
Common face brick	per M.	24.00	16.50*	19.00	30.00
No. 1 dry pressed brick	per M.	31.00	30.00	36.00	70.00
No. 2 dry pressed brick	per M.	29.00	25.00	32.00	
Enamelled brick	per M.	125 up to	230.00	185.00	150.00
Wire cut brick, for foundation work	per M.	21.00	19.00		50.00
Sand lime brick	per M.	17.00		18.00	
Hollow building tile	per M			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	60-95	60-75	85-100	80.00
Fire clay	per ton	13-20	15-16.00	35.00**	22.00

STONE, SAND and GRAVEL (f.o.b. cars on siding):—

		Toronto	Montreal	Winnipeg	Vancouver
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.00 yd.
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 "	" "
Crusher run	per ton	2.20½		3.00 "	" "
Rubble stone	per ton	2.45	1.70	15.00 cord	" "
Gravel, 2 in. screened	per ton	2.05		2.45 yd.	" "
Gravel 1 in. screened	per ton	2.31	1.50	2.75 "	" "
Sand, screened	per ton	1.42½	1.25	1.90 "	" "
Pit run	per ton	1.52¾	1.25	1.90 "	" "

STEEL and IRON (f.o.b. warehouse):—

		Toronto	Montreal	Winnipeg	Vancouver
Mild steel bars, ¼ in. and heavier	per 100 lbs.	3.25 base	3.25 base	4.35	$4.00
Bands 3/16 in. and lighter	per 100 lbs.	3.75 "	3.25 "	4.85 base	
Hoops	per 100 lbs.	4.50 "	4.25 "		
Twisted and deformed bars	per 100 lbs.	3.35 "	3.25 "	4.20	4.00
Angles, channels and tees under 3 in.	per 100 lbs.	3.35 "	3.75 "	4.95	6.00
Structural shapes	per 100 lbs.	3.60 "	3.75 "	4.75	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.25 "	3.50 "	4.75	6.25
Plates—3/16 in.	per 100 lbs.	3.60 "	3.85 "	5.15	6.50
Plates—10 gauge	per 100 lbs.	4.15 "	4.00 "	5.45	6.50
Black sheets—28 gauge	per 100 lbs.	5.00 "	4.50 "	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.20 "	6.00 "	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	6.20 "	6.50 "	7.70	8.25-8.50
Rivets	per 100 lbs.	5.75 "	5.50 "	7.00 base	
Cast iron pipe	per ton	60.00	55.00		

VITRIFIED CLAY PRODUCTS (Delivered on job):—

		Toronto	Montreal	Winnipeg	Vancouver
Sewer pipe, 4 in.	per ft.	.40	.30	.35	.38
Sewer pipe, 6 in	per ft.	.60	.45	.45	.48
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.55
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.70
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.85
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00	.90	.65	.75
Chimney tops	each	9.00	3.50–5.00	7.50	4.50–6.00
Discounts		45 % truck lots	20 %		
		50 % car lots	50 %	5 %	

CEMENT:—*Discount of 10 cts. per bbl. in 20 days. Price f.o.b. cars is $3.75 †Subject to 5% discount. **Excluding bags

LIME:—*Discount of 5%. †Bag of 50 lbs. **Price f.o.b. cars is $11.70.

BRICK AND TILE—*f.o.b. plant.

STONE SAND AND GRAVEL:—*Winnipeg prices subject to 5% disco **Toronto prices include sales tax.

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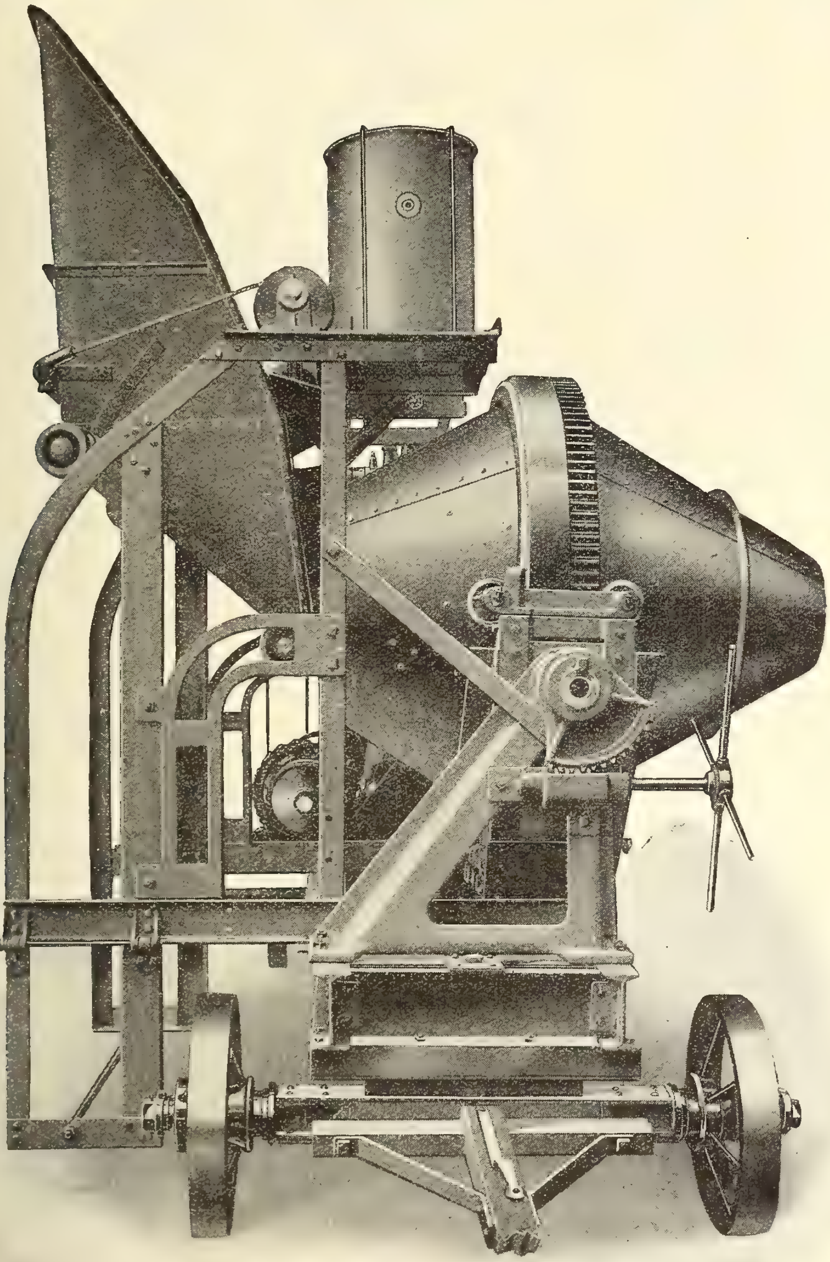

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CURRENT PRICES OF BUILDING AND ENGINEERING MATERIALS— continued

Lumber (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver*
Flooring, 1 x 3 and 4 in., clear, E. G. fir	per M.	100.00	60.00	84.00	55.00
Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	75.00	65.00	56.00	30.00
Flooring, No. 1 pine	per M.	70.00	80.00	64.80	
Flooring, No. 1 Spruce	per M.	45.00	40.00	39.60	
Flooring, birch and maple, 13/16 in. clear	per M.	130.00	110.00	152.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	130.00	125.00	140.00	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	75.00	60.00	56.00	30.00
V joint, No. 1 pine	per M.	70.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	43–58	45.00	63.75	
Pine, 2 x 4 to 12 in., common rough	per M.	50/55	70.00	56.00	
Hemlock, 2 x 4 to 12 in.	per M.	40-42.00	40.00	36.00	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	40–50.00	50.00	36.00	11.00-13.50
Spruce, 1 and 2 x 4 to 12 in.	per M.	41/46	45–35	36.00	
Timbers, fir, 10 x 10 in. and up	per M.	65.00	58.00	47.00 base	17.-22.00
Lath, No. 1 white pine	per M.	14.00	12.00	12.00	
Lath, M. R. spruce	per M.	10.00	8.50	10.00	7.00
Shingles, XXX B.C. cedar	per M.	6.35	5.00	5.25	3.40
XX B.C. cedar	per M.	5.00	4.25	3.75	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	108.00	55.00
Fir casing	per M.	1 ct. per in.	100.00	108.00	

PAINTS, OILS, COLOURS (delivered):—					
White lead ground in oil, less than ton lots	per cwt.	14.55	13.75	14.85	15.80
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	22.00
Putty in bulk	per cwt.	5.45	4.25	5.50	9.25
Steel sash putty in bulk	per cwt.	5.95	6.00	8.75	7.75
Boiled linseed oil, in bbls.	per gal.	1.20	1.14	1.13	1.28
Raw linseed oil, in bbls.	per gal.	1.23	1.12	1.10	1.25
Turpentine, in bbls.	per gal.	2.20	2.10	2.15	1.60
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 4/5	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 1/5	.45

PLASTER (Delivered):—					
Hard wall plaster, sanded	per ton	13.50	15.00	25.00	30.00
Plaster of paris, in bbl. lots	per bbl.	6.00	5.35	1.60 bag*	7.50
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu.	1.50

LABOR:—					
Bricklayers	per hr.	1.00	.80–.90	1.15	1.06¼
Structural Iron Workers	per hr.	.85	.50–.75	1.25	1.00
Plasterers	per hr.	1.00	.80	1.05	1.06¼
Hoisting Engineers	per hr.	.70–.80	.50	.90–1.10	1.00
Plumbers	per hr.	.90	.60–.75	1.00	.90
Carpenters	per hr.	.80	.65	.90	.81¼
Painters	per hr.	.75	.55–.65	.80	.81¼
Electrical Workers	per hr.	.80	.65	.70– .90	1.00
Roofers	per hr.	.65	.65		.90
Laborers	per hr.	.40–.50	.30	47½–.55	.50–.56¼
Sheet Metal Workers	per hr.	.75			.90

LUMBER:—*Owing to the general unstable condition of the present lumber market, Vancouver dealers refuse to quote any prices at all especially for Prairie or Eastern publication. The prices are, moreover, fluctuating from day to day. Such prices as we quote are, therefore, averages and not standard.

PLASTER *Including bags.

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PEA GRAVEL
SAND

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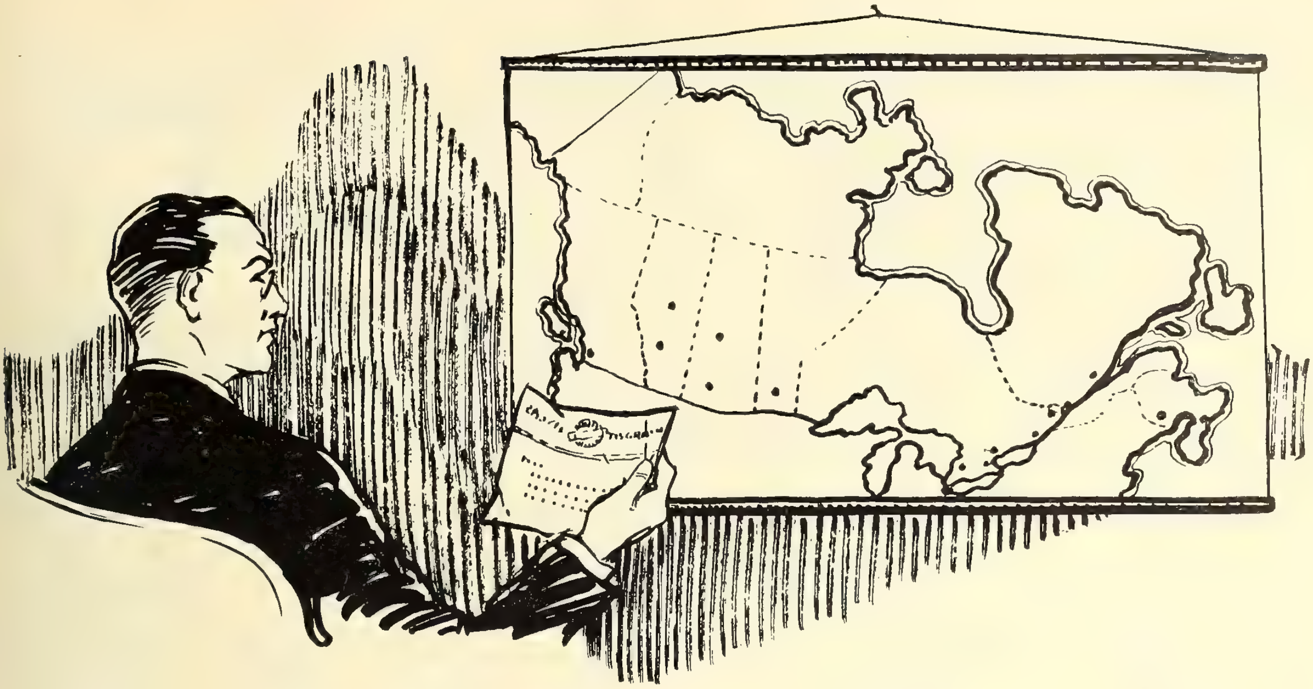

The Baffled Sales Manager

NELSON McFARLAND sat at his big desk, a telegram clutched tightly in both hands, staring savagely out of the window.

He read the telegram again—

And wheeling around in his chair, he glared still more savagely at the big map of the Dominion which hung on the wall behind his desk.

Frankly, McFarland was puzzled. The thing had happened a good many dozen times since the first of the year —and was still happening.

Two evenings before, the President of the Henderson Steel Products Company—McFarland's chief—had called him about an advance tip on a big mill and elevator job going up at—— Mr. Henderson had gotten his information from Mr. Cummings, one of his associates whom he had met at the bank directors' meeting that evening. He had phoned McFarland immediately upon arriving home and by a hurried wire the Sales Manager had roused his star man, Churchill, from his sound slumbers in a distant city and gotten him started on his way toward the project.

But the whole trip had been futile. Just how futile, the telegram told very eloquently. Like so many other long jumps in the past several months, there was nothing to show for the trip except a big expense account and two days wasted time.

McFarland read the telegram again for the seventh time. Only ten words —but ten words that were very much to the point indeed:

"MARTINDALE SECURED CONTRACT TUESDAY. AM RETURNING TO TERRITORY. LETTER FOLLOWS.—Churchill.

How Advance Sales Facts brought leadership to one firm

"MARTINDALE"

Every firm in the field feared Martindale. There was something almost uncanny about his methods of getting advance information. He had beaten McFarland and his forces many a time—just as he had beaten him on this job.

Time after time the sales manager of the Henderson Company had been put to pacing the floor with furrowed brow, because of Martindale's tactics.

Martindale had taken the———— Bridge job right out from under Henderson's nose, so to speak. The—— office building had gone to Martindale in much the same way. The road construction job at ————was in Martindale's hands a week before Henderson's men arrived on the ground.

These things brought Martindale the reputation of being a master-strategist—a business-general of the highest order—a man whose firm won almost always. They won fairly, by the clean-cut superiority of their methods of acquiring first-hand information of building projects.

Not only did Martindale get business that others failed to get but he got it at lower cost. His prices showed that. He underbid every competitor—yet his annual statement showed a better return on his invested capital than any other firm in the business.

There was some reason for this—his competitors in those days would have given much to know it.

He could have explained it, too, had he chosen.

In the first place, Martindale's men did not beat the bush for prospective buyers.

"My men are too valuable for that," he said. "They must be kept busy on live leads—actually selling—not merely hunting for possible chances to sell."

All this was mighty good logic—but the question with the other men in the field was: "How can WE do it?

Martindale's salesmen were producers—regular consistent producers. He supplied the means—they had to produce or get out—and they knew it.

He saw too that those men made no useless trips with long expense accounts such as Churchill, of the Henderson Company, had just run up. He kept the expenses down to bedrock, lower, in fact, than any firm in his line. Yet Martindale's men got the business for him—and at a better net profit.

Seven years ago, Martindale was one of the light-weights in his line. Today he has outdistanced Henderson and the next largest firm and is going at a great clip, growing by leaps and bounds—looked upon not only as the leader but the "comer" in his field.

And the secret of this success, had Martindale been willing to reveal it, was: **Getting his sales-information First; getting it RIGHT; and then beating his competitors to it on a basis of efficiency.**

Getting Sales Facts First

You, too, may secure sales information FIRST through using MacLean Building Reports in your business. Our new booklet "Getting Sales Facts First" explains our remarkable system in detail. We invite you to send for a copy. It gives all the facts. Sending for it has been the first step toward larger profits on the part of many hundreds, including the firm whose story is told on this page. A copy is waiting for you.

MacLean Building Reports, Ltd.

345 Adelaide Street W., Toronto
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325 Main St., Winnipeg

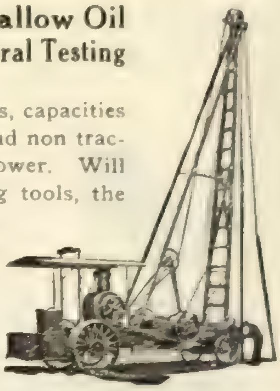
Send me "Getting Sales Facts First," which I may keep without obligation.

Name ....
Print here

Firm ....

Business Address ....

What territory do you cover? ....



Cyclone Churn Drills

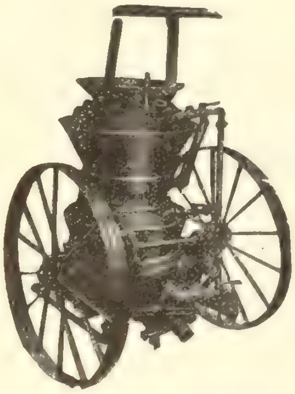
For Blast Hole, Water, Shallow Oil and Gas Well Drilling and Mineral Testing

The No. 14 Cyclone Blast Hole Drill is a machine especially designed and constructed for drilling blast holes in quarries, open pit mines and for heavy rock excavation. Built in two sizes in both traction and non traction types with gasoline, electric or steam power. Covered in our Catalog B-45.

Cyclone Well Drills are built in 5 sizes, capacities 200 to 2000 feet and in both traction and non traction types with gasoline or steam power. Will operate cable and hollow rod drilling tools, the latter by either the self-pumping or jetting process. Well Drills are described in our Catalog A-70

The Sanderson-Cyclone Drill Co., Orrville, Ohio, U.S.A.

Mussens Ltd., Canadian Representatives — Montreal, Toronto, Winnipeg and Vancouver



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A remarkable example of how Gunite can combat the effects of fire is given by our European agency:

"The chocolate factory of Sarotti Company, Berlin, Germany, was visited by fire, during which the concrete columns and girders were badly damaged and other concrete work destroyed. Gunite was "shot" onto the damaged members by means of the Cement Gun and so completely were they restored as to allow the addition of an extra floor to the building.

The Cement-Gun is not a restricted article. It may be purchased from us and used by anyone.

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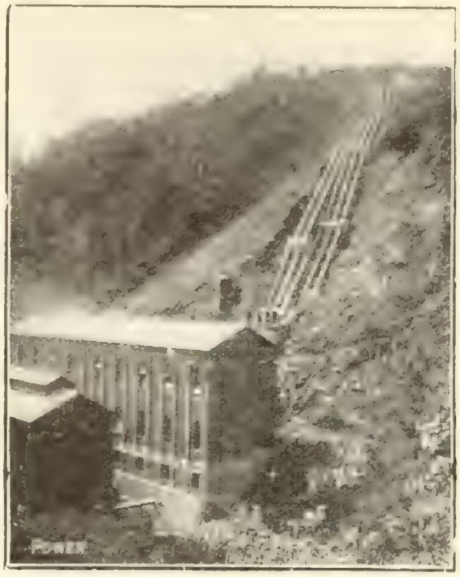

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In the operation of a hydro-electric power station it is necessary to know at all times the electrical output of each generating set. This information is always available from the electrical meters at the switchboard. It is equally necessary to know the amount of water supplied to each generating set. One factor without the other will not tell the story of efficiency. If the plant is designed and built with a

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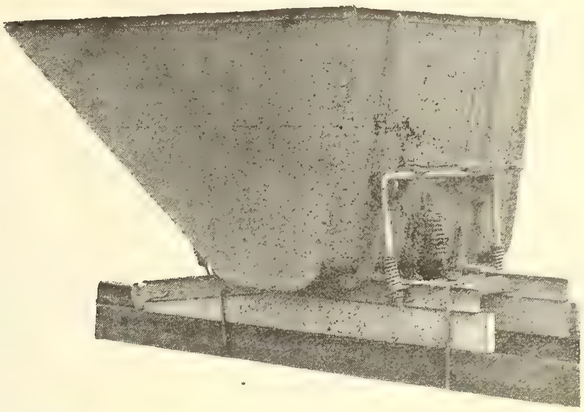

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DEPARTMENT OF LABOUR

BOILER INSPECTION NOTICE

Excerpt from Regulations for the Construction and Inspection of Boilers

Section 300

No Boiler which has been in use for two or more seasons shall be sold or exchanged for subsequent use as a Boiler unless it is accompanied by an inspection certificate issued by the Department within one year preceding the date of such sale or exchange. The allowable working pressure for such Boiler shall be determined by the Inspector from the formulæ contained in the regulations, with such deductions in pressure for depreciation as the Inspector's judgment shall dictate.

The travelling expenses in connection with the inspection of Boilers sold, exchanged or extensively repaired, must be paid by the owner or purchaser of such Boilers, together with the inspection fee of five dollars.

All communications should be addressed to the Steam Boiler Branch, Department of Labour, Spadina Crescent.

HON. W. R. ROLLO,
Minister of Labour.

D. M. MEDCALF, Chief Inspector of Steam Boilers.

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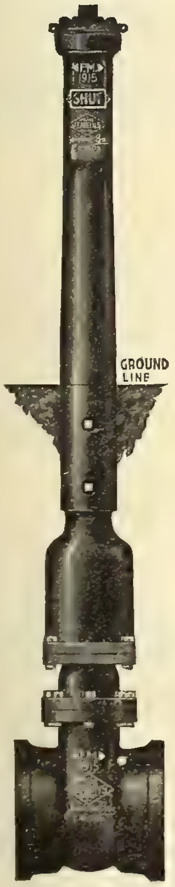

Fig. 845 complete with valve

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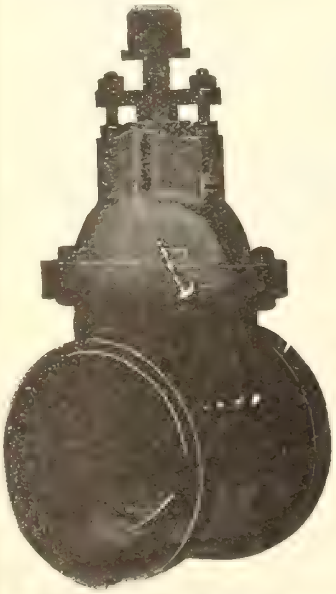

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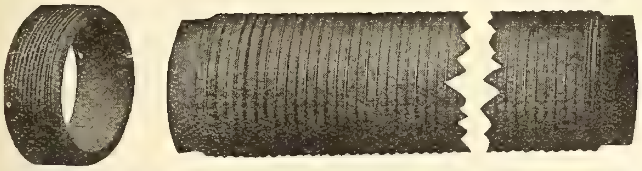

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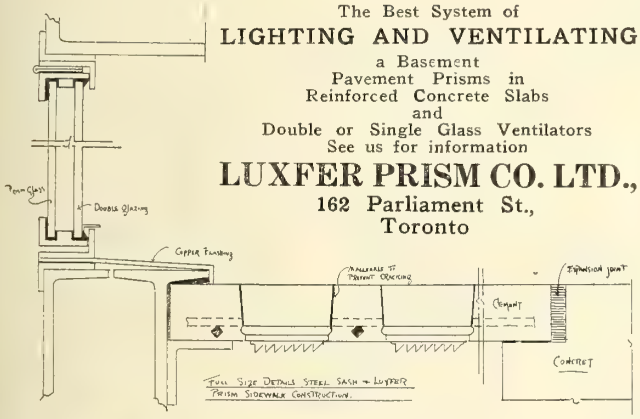
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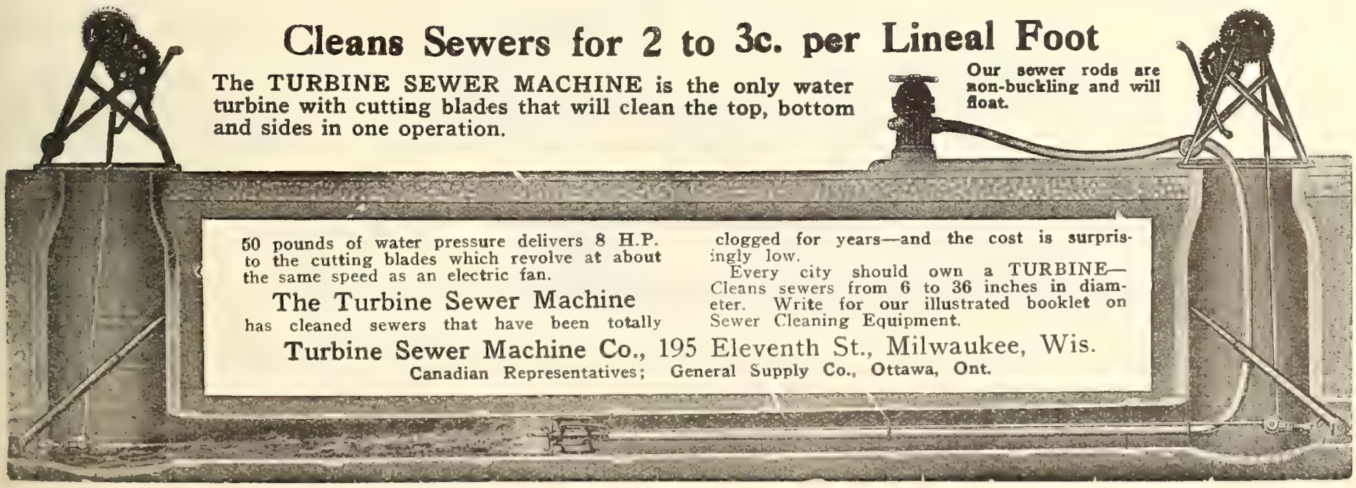

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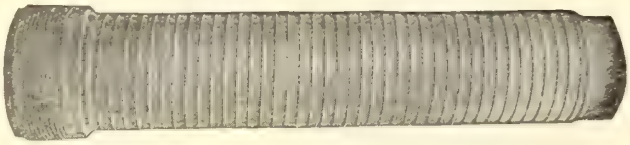

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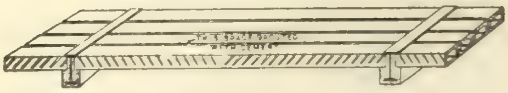

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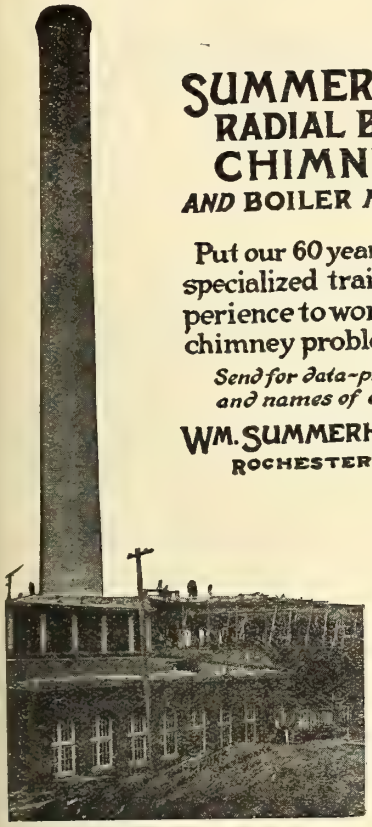

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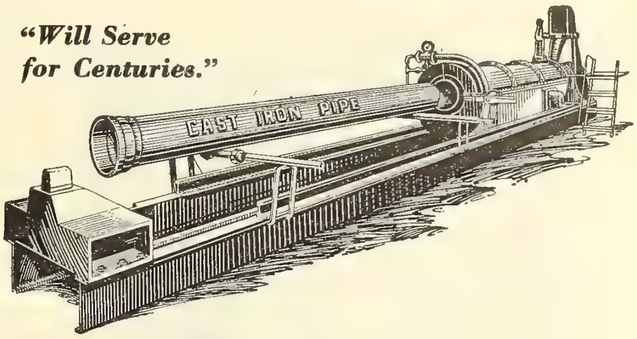

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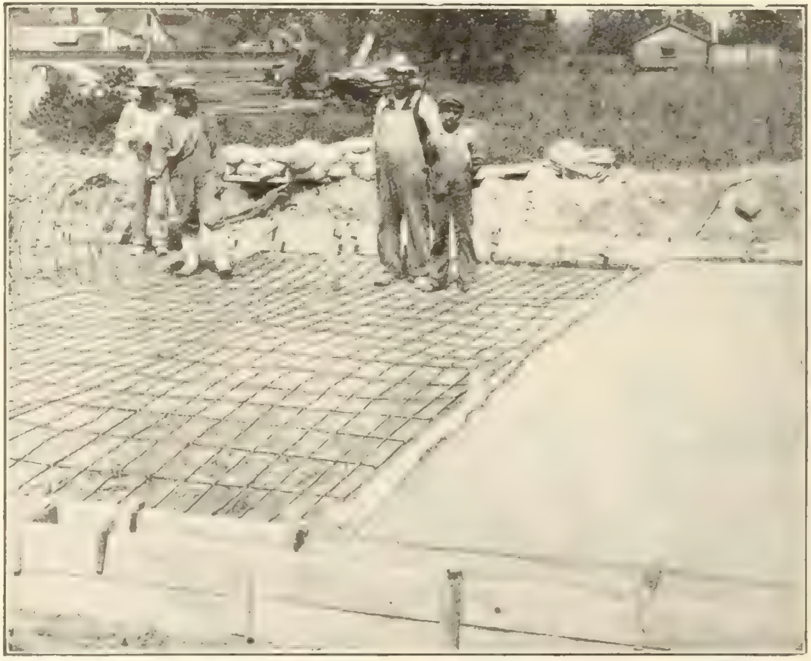

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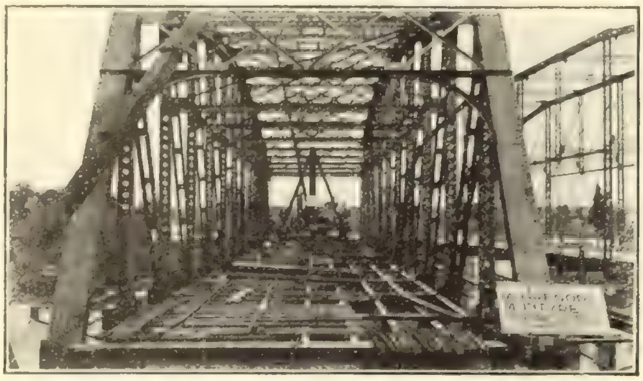

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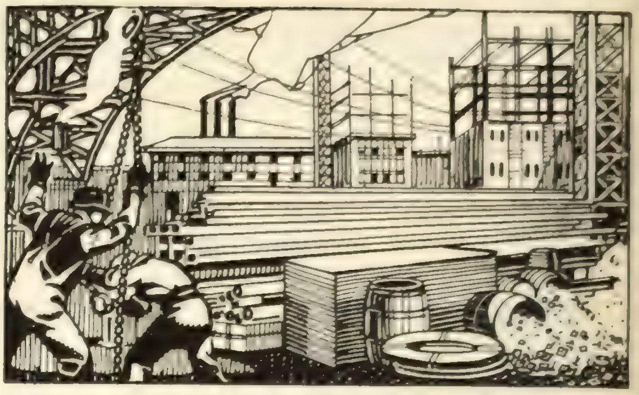

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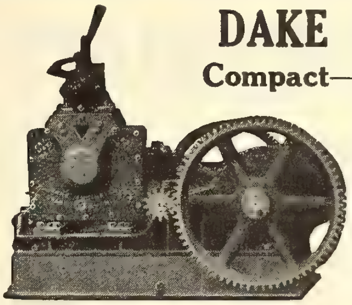

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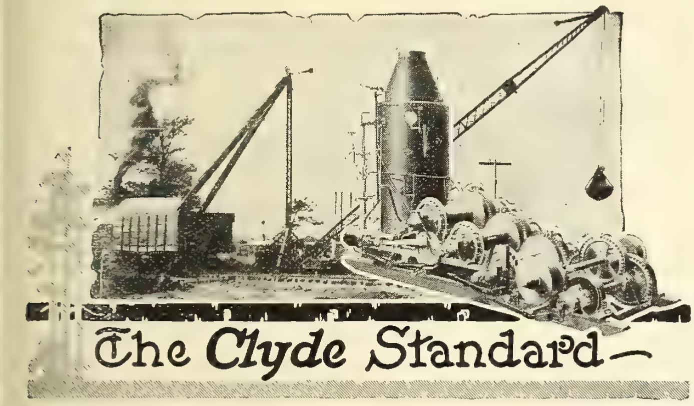

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High Grade Roof Coating Cements and Paints.
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The Wheels are Beginning to Turn

Building—the basic industry of Canada to-day is entering an era of tremendous activity. Slowly but surely the movement toward great constructive enterprises is getting under way.

Canada's Construction field represents one of the big potential markets of the world for all commodities used in connection with Construction and Engineering.

Canada's National Building Journal, the "CONTRACT RECORD," is the one medium through which this market can be reached.

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The name "Fibre Board" does not do justice to the astonishing qualities of this unique building board.

It deserves a name as distinctive as its exceptional features—of which there are ten—Ten Big Features—Every feature tested—every test certified. These Ten Tested features give Fibre Board its new name "Ten Test Solid Fibre Board."

The ten tests are explained and illustrated in a book we have prepared entitled, "What, Why and How to Use Ten Test Solid Fibre Board."

It tells why Ten Test Solid Fibre Board is the ideal building board to use for interior and exterior walls, and for ceilings and floors. It tells how and why Ten Test Solid Fibre Board ensures a perfect bond with stucco or plaster.

A copy of this interesting book is yours FREE for the asking. Send for it now. Address Dept. 2.

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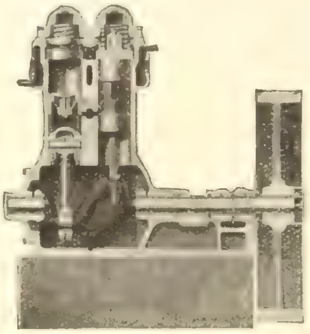

Section of YORK Enclosed Ammonia Compressor showing simplicity of construction

YORK Enclosed Ammonia Compressors

are designed and constructed *for the BUSINESS*

—which requires a Refrigerating Machine of moderate initial cost, that is reliable under all conditions—does not require a skilled operator, nor an experienced mechanic to make repairs. Although the necessity for repairs is almost negligible, it is realized that wearing and bearing parts must deteriorate eventually. All parts of York Enclosed Compressors are made to jigs and templates, insuring the fit of repair parts. The simplicity of construction makes it possible for any employee to take care of a York Refrigerating Machine.

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Many of the newest and best buildings in the cities of Ontario are equipped with "Turnbulls."

In Toronto, patrons of the Mason & Risch store are carried to the spacious showrooms in Turnbull Elevators.

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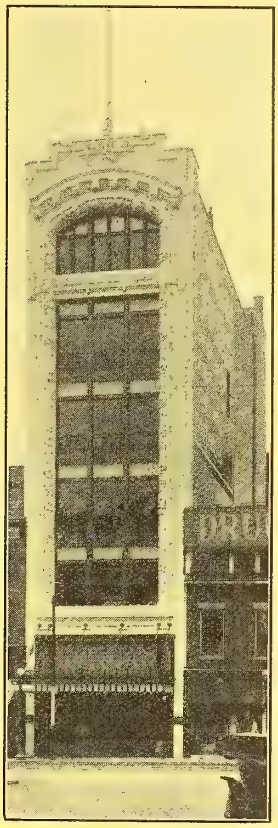

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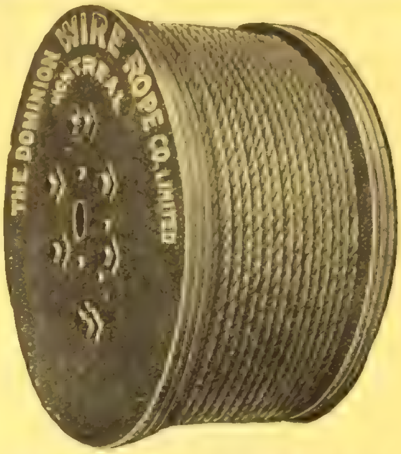

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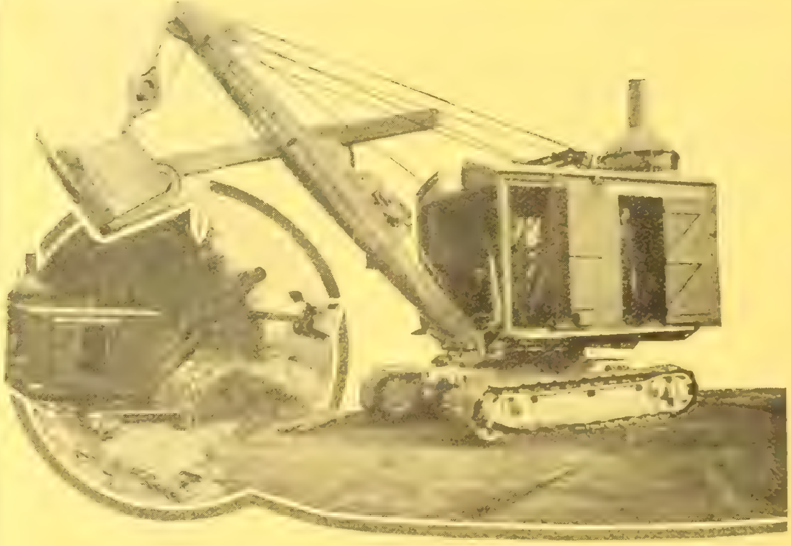

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Greater bail pull at dipper.

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More speed, greater power, longer life.

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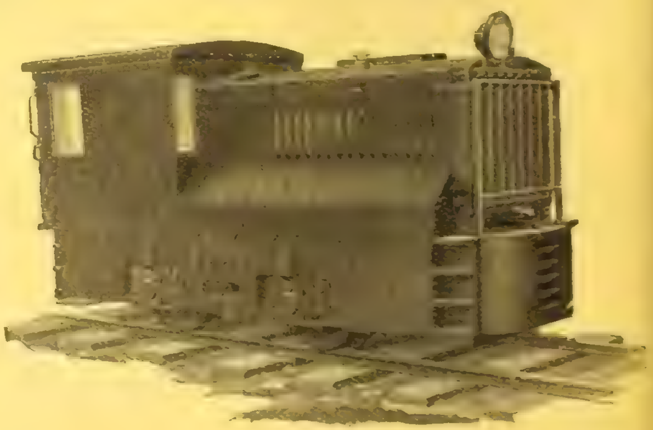

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Vol. 37 Toronto, February 28, 1923 No. 9

Contract Record and Engineering Review

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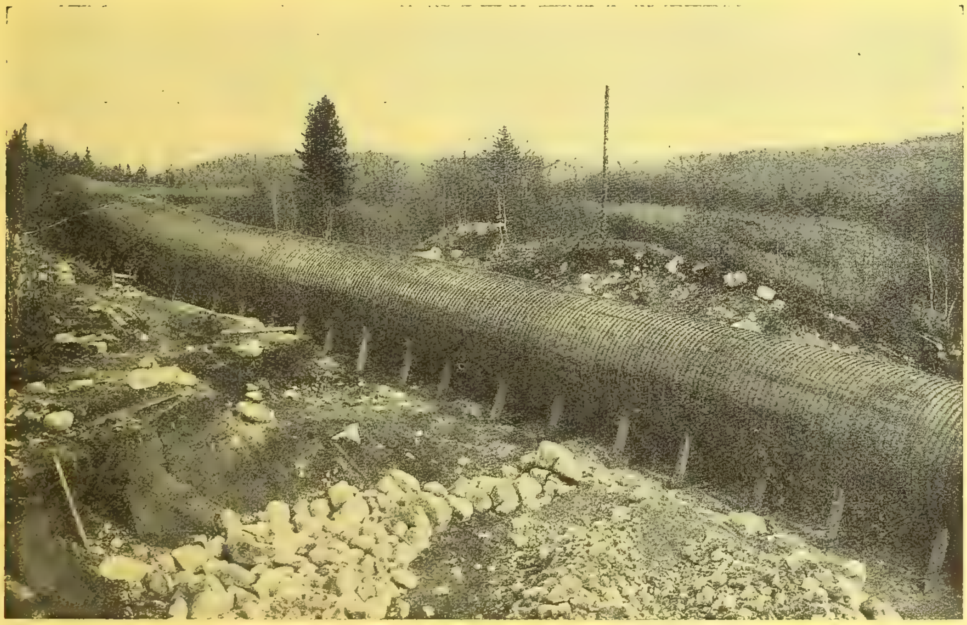
For long and Satisfactory Service

"Pacific" Wood Pipe is in use today from the Atlantic to the Pacific Coast for Hydro-Electric development and is giving every satisfaction: Our specialty, complete construction.



This 10 ft. dia. Wood Pipe has recently been completed by us for the Nova Scotia Power Commission's development at St. Margaret's Bay N. S.

Write us for information

Pacific Coast Pipe Co., Limited

1551 Granville Street - - Vancouver, B.C.

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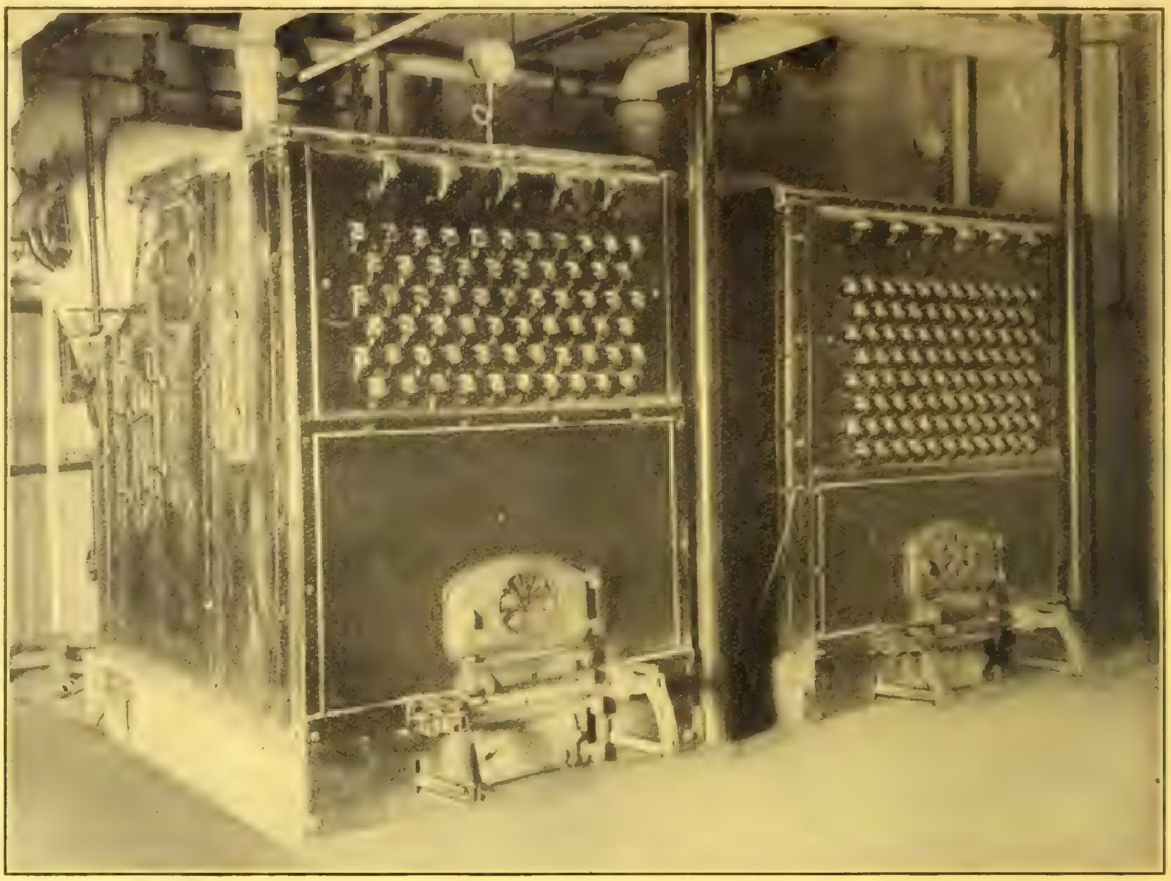

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Water Tube Heating Boilers

Are designed to efficiently and satisfactorily Heat all kinds of Public Buildings such as Schools, Churches, Business Blocks, etc.

Recent Installations include:—The Ottawa Collegiate; Ottawa Citizen Bldg; Rockliffe School, Ottawa; La Corona Hotel, Montreal; Kitchener-Waterloo Collegiate; County Court House, Ottawa; Guelph Collegiate; Laroeque's Store, Ottawa; McIrvine Block, Galt; Kitchener Y.M.C.A.; Galt Y.M.C.A.; G. Ruppel & Co., Kitchener; Dominion Shirt Co., Kitchener; The Hurlbut Company, Preston.

Illustration shows the Kitchener Y.M.C.A. Installation

Ask for Circular, Prices, etc.

Office of J. ALBERT EWART, B.A.Sc,
Architect,
Jackson Building,
Ottawa.
February 6th, 1923.
The Goldie & McCulloch Co. Limited,
38 Monk Street, Ottawa, Ont.

Dears Sirs:

Answering your letter of February 5th, regarding the type "H" Water Tube Heating boilers which have been recently installed at the Ottawa Collegiate Institute, I beg to state that these boilers have been in operation since the beginning of the winter and are giving entire satisfaction. I made inquiries to-day as to how they were working and Mr. Pearce reported that they were doing fine. As you are aware this was an exceptionally cold morning and it is a pleasure to know that we have a heating plant that can handle everything it is called upon to do without trouble.

This type of boiler we find to be a very fast steamer, so that the fireman can heat the building very quickly at any time when the fire happens to go down.

I should be very glad to recommend this type of boiler to any of your clients.

Yours very truly,
J A E/V M C K J. A. EWART.

NOTE:—Tuesday, Feb. 6th, 1923. The morning referred to above temperature registered 24° below zero.

The GOLDIE & McCULLOCH CO. Limited

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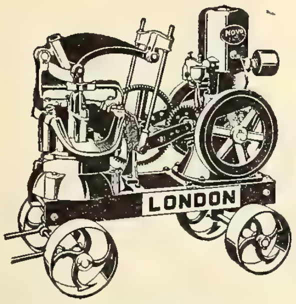

Fig. 173
London Diaphragm Trench Pump

LONDON PUMPS AND PUMPING OUTFITS

are made in all the various designs and sizes for Contracting, Municipal, Engineering and Industrial purposes.

Fig. 173 illustrates the London Diaphragm Pump operated with vertical gasoline engine; capacity, 3,000 gallons per hour. This outfit is also built with duplex pump, capacity 6,000 gallons per hour and is suitable for any kind of pumping with suction lift up to 20 ft. Fully described in Bulletin 27-R-1.

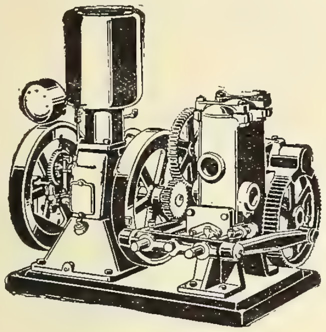

Fig. 1330
London High Pressure Pump

Fig. 1330 illustrates the London High Pressure Pump with vertical gasoline engine. This outfit may be equipped with either electric or gasoline motor. It is built in several sizes and for pressures up to 500 pounds and in capacities from 700 to 2,800 gallons per hour.

This design of pump is suitable for pumping water long distances and at high elevation. For such work as road building, supplying water to summer homes or any kind of work where a constant high pressure is required. Described in Bulletin 27-R-2.

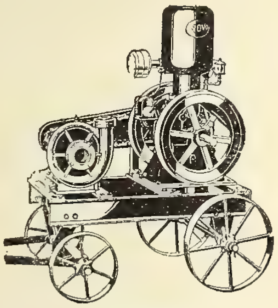

Fig. 265
London Centrifugal Pumping Outfit

Fig. 265 illustrates the London Centrifugal Pumping Outfit with vertical gasoline engine. Built in sizes,—3″ suction up to 6″ suction, mounted on skids or trucks. May be furnished direct connected or chain belt drive, and with gasoline or electric motor. This type of pump is designed for a head up to 130 ft. and is largely used by Municipalities for pumping sewage and in the Contracting and Building Industry these outfits have a wide and varied use.
Described in Bulletin 27-R-3.

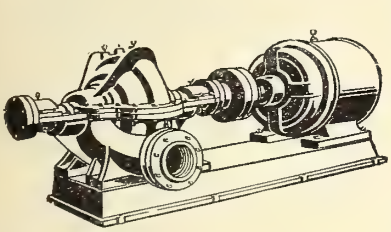

Fig. 2693
London Centrifugal Pump

Fig. 2693 illustrates the London Centrifugal Pump, motor driven. These pumps are built in,—1, 2 and 3 Stage types and in all sizes from 1″ up to 24″ and in sizes to meet every Industrial and Municipal requirement. Specifications, Blue Prints and Photographs furnished on receipt of detailed information as to requirements. Submit your pumping requirements to us.

Made in Canada

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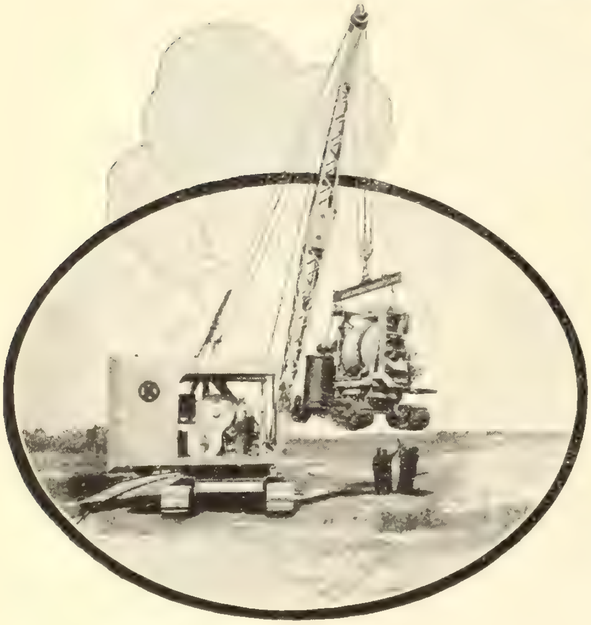

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No double function levers. Combine any functions at will as a time-saving practice. The Koehring is designed for it. No penalty of excess wear.

Koehring "heavy duty" construction means the utmost of safety-margin against breakdowns and delays, the utmost of trouble-free service life.

Write for Koehring Crane Catalog No. 000 today

No. 2 Capacity: 12 tons at 12′ radius. ½ yard clamshell bucket loaded with sand or gravel at 45′ radius. ¾ yard clamshell bucket loaded with sand or gravel at 39′ radius. 1 yard clamshell bucket loaded with sand or gravel at 33′ radius. 1½ yard clamshell bucket loaded with sand or gravel at 24′ radius. 1 yard Page drag bucket on a 40′ boom.

No. 3 Capacity: 20 tons at 12′ radius. 1 yard clamshell bucket loaded with sand or gravel at 50′ radius. 1½ clamshell bucket loaded with sand or gravel at 39′ radius. 2 yard clamshell bucket loaded with sand or gravel at 33′ radius. 1½ yard Page drag bucket at 40′ radius.

No. 1 Capacity: Equipped with 30′ boom. Handles ¾ yard bucket at 25′ radius; lifting capacity at 12′, 14,000 lbs. 4 cylinder 5″ x 6″ gasoline engine.

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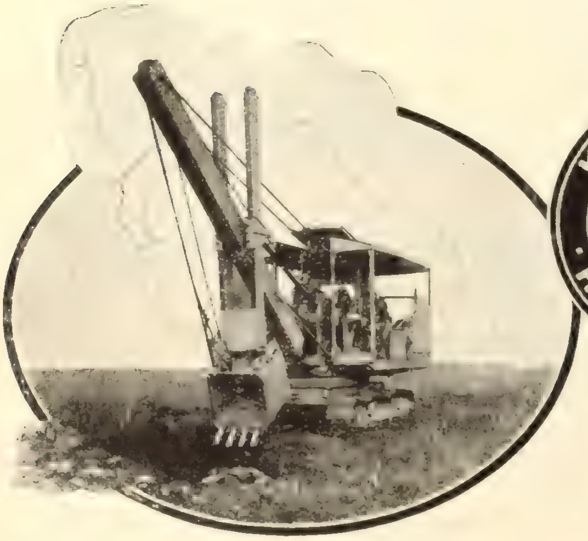

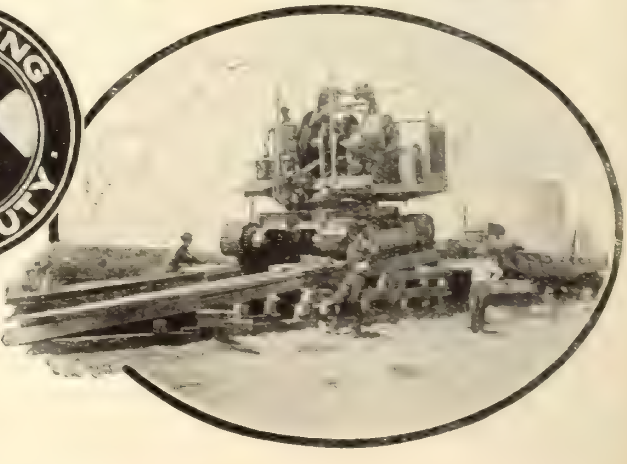

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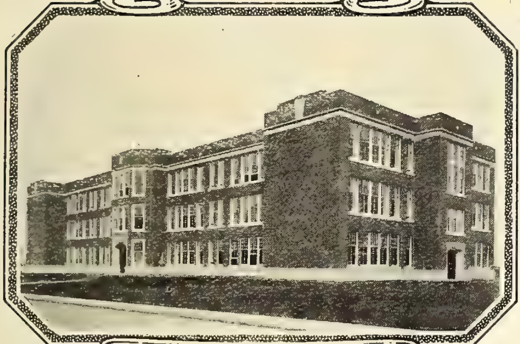

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Rawlinson School,
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D. R. Franklin, Architect

Danforth Park Public School,
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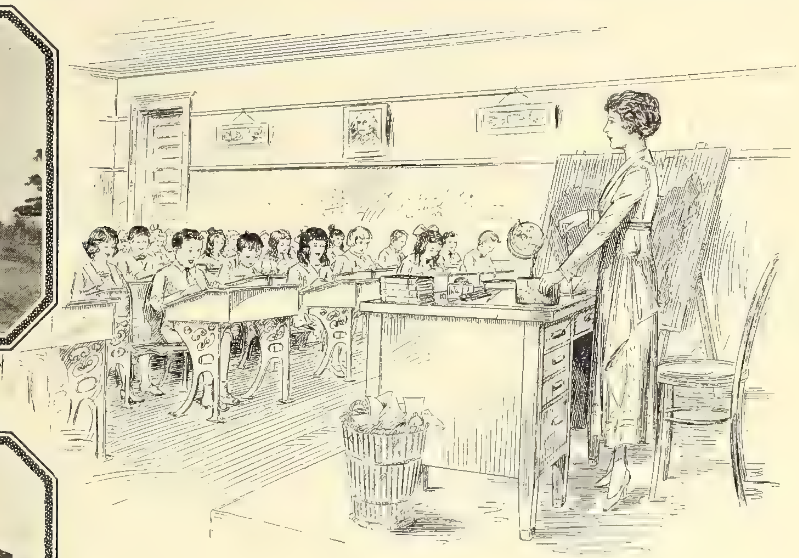
S. B. Coon & Son, Architects



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FOR ECONOMY AND ENDURANCE

The School Building of today is an utilitarian building in which architectural beauty is recognized as one of the utilities.

"Atmosphere" depends largely upon architecture, and NATCO Hollow Tile meets the most varied requirements of exterior finishes.

The Architect is able to assure not only attractiveness, spacious accommodation and comfort—but also, the most important of all—safety for the children from fire.

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Koehring Co., of Canada
Turnbull & Co., Harvard

Concrete Block Machinery
London Concrete Machry. Co.

Concrete Carts
London Concrete Machry. Co.

Concrete Culvert Pipes
Dominion Concrete Company

Concrete Machinery
Canadian Austin Machinery
Koehring Co., of Canada
London Concrete Machry. Co.
Mussens Limited

Concrete Mixers and Appliances
Canadian Austin Machinery
Hopkins & Co., Ltd., F. H.
Koehring Co., of Canada
Mussens Limited
Turnbull & Co., Harvard

Concrete Hardner
Spielman Agencies Regd.

Concrete Sewer Pipe
Dominion Concrete Company

Conduits
Canadian Johns-Manville Co.
Conduits Company, Limited
National Conduit Company
Vitrified Clay Pipe Publicity Bureau

Conduits (Wooden Pressure Creosoted
Pacific Coast Pipe Co.

Contractors
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Cape & Company, E. G. M.
S. E. Dinsmore
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Kilmer & Barber
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Canadian Equipment Co.
Canadian Ingersoll Rand Co.
Canadian Link-Belt Co.
Canadian Mead-Morrison Co.
Clyde Iron Works Sales Co.
Confederation Equipment Co.
Dake Engine Co.
Dominion Road Machry. Co.
Gartshore, John J.
General Products Co.
Hamilton Bridge Works Co.
Hepburn, Ltd., John T.
Koehring Co., of Canada
London Concrete Machry. Co.
McGovern, T. J.
Mussens Limited
Orton & Steinbrenner Co.
Osgood Company
Thew Shovel Co.
Turnbull & Co., Harvard
Webster & Trory

Conveying Appliances
Canadian Austin Machinery
Mussens Limited

Cranes, Travelling and Locomotive
Ball Engine Co.
Canadian Austin Machinery
Canadian Equipment Co.
Canadian Link-Belt Co.
Canadian Mead-Morrison Co.
Clyde Iron Works Sales Co.
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Erie Steam Shovel Co.
Hopkins & Co., Ltd., F. H.
Hepburn, Ltd., John T.
Koehring Co., of Canada
Mussens Limited
Orton & Steinbrenner Co.

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Britnell, Limited
Dom. Tar & Chemical Co., Lt

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Canada Crushed Stone
Crushed Stone, Limited
Hagersville Crushed Stone Co
Queenston Quarries Co.
Rogers Supply Co.
Standard Lime Co.
Standard White Lime Co.

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Canadian Ingersoll Rand Co.
Dominion Road Machry. Co.
Hopkins & Co., Ltd., F. H.
London Concrete Machry. C
Mussens Limited
Rogers Supply Co.

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Oakley & Sons, Geo.
Queenston Quarries Co.

Cutting Edges
Shunk Mfg. Co.

Damp Proof Coating
Barrett Company, Ltd.
Imperial Oil Company, Ltd.
Dom. Tar & Chemical Co., Ltd.

Derricks and Derrick Fittings
Canadian Mead-Morrison Co.
Clyde Iron Works Sales Co.
Hepburn, Ltd., John T
Hopkins & Co., Ltd., F. H.
Mussens Limited
Turnbull & Co., Harvard

Ditchers
Buckeye Traction Ditcher Co.
Canadian Austin Machinery
Mussens Limited

Ditching Machines
Ball Engine Co.
Buckeye Traction Ditcher Co.
Canadian Austin Machinery
Erie Steam Shovel Co.
Mussens Limited

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Pannill Door Co.

Drafting Supplies
Geo. Vincent

Drag Line Excavators
Canadian Austin Machinery
Canadian Equipment Co.
Koehring Co., of Canada
Mussens Limited
Orton & Steinbrenner Co.

Dredging Pumps
Canadian Blower & Forge C

Dredges
Canadian Equipment Co.
Canadian Mead-Morrison Co.
Hopkins & Co., Ltd., F. H.
Mussens Limited

Drills
Hopkins & Co., Ltd., F. H.

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Dust Blowers
Sturtevant, B. F. & Co.

Dump Bodies
Dominion Truck Equipment Co.

Dump Cars, Wheels, etc.
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Hopkins & Co., Ltd., F. H.
MacKinnon Steel Company
Mussens Limited

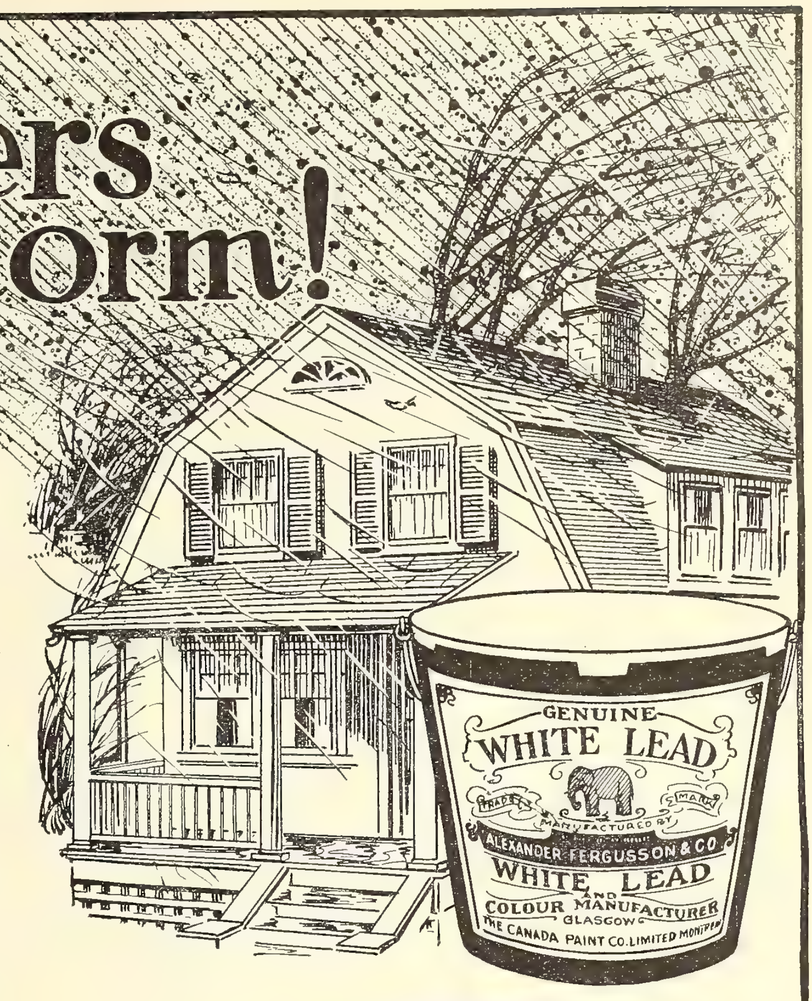
Drying Apparatus
Canadian Blower & Forge
Sturtevant, B. F. & Co

Electric Fans
Sturtevant, B. F. & Co

Electric Water Systems
H. Mueller Mfg. Co., Limited

(Continued on page 8)

Weathers every storm!



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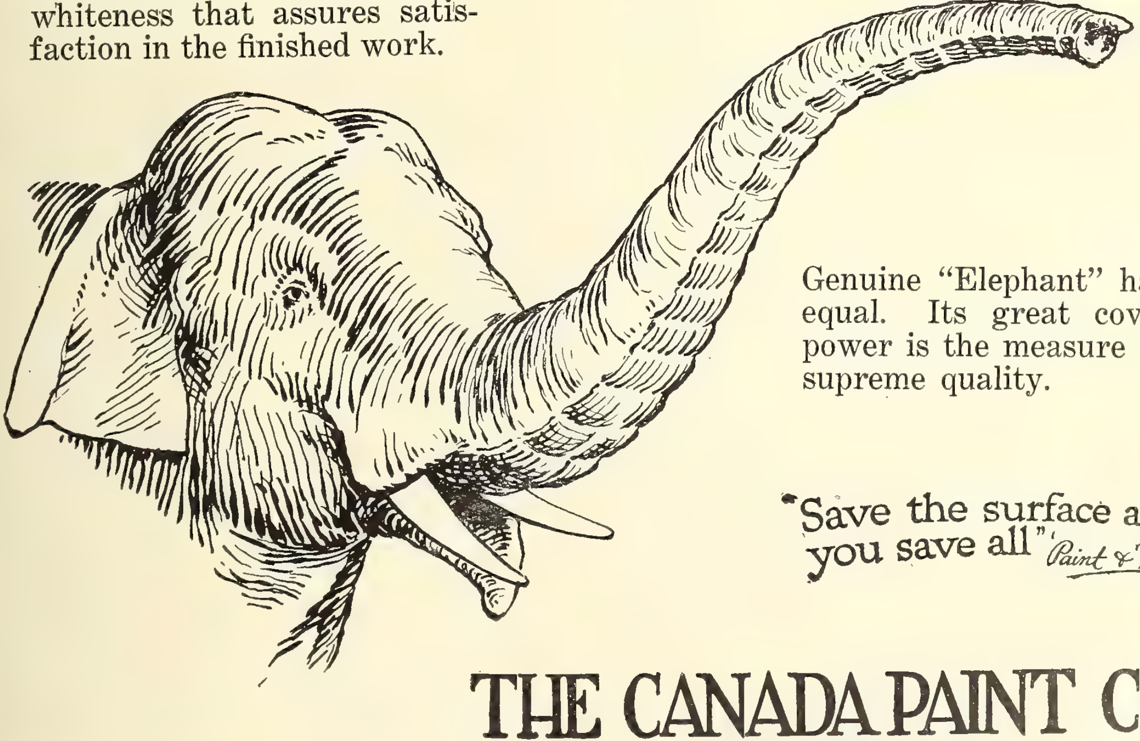

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Burlington Steel Company
Canada Iron & Wire Works

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Bates Valve Bag Co.

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Canadian Johns-Manville Co.
York Manufacturing Co.

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Road Asphalt
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Can. Fairbanks-Morse Co., Ltd.
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Koehring Co., of Canada
McGovern, T. J.
Mussens Limited
Waterous Engine Works Co.
Sauerman Bros.

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Dom. Tar & Chemical Co., Ltd.

Road Oil
Barrett Company, Ltd.
Imperial Oil Company, Ltd.

Road Tar
Barrett Company, Ltd.
Dom. Tar & Chemical Co., Ltd.

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Roofing Cement
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Dom. Tar & Chemical Co., Ltd.
Imperial Oil Company, Ltd.
Vitrified Clay Pipe Publicity Bureau

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Ormsby Company, A. B.

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Queenston Quarries Co.

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Philip Gies Foundry

Sewer Pipe
Britnell & Company
National Iron Works
Vitrified Clay Pipe Publicity Bureau

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Shingle Stain Oil
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Dom. Tar & Chemical Co., Ltd.

Shovels (Steam)
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Canadian Equipment Co.
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Silo Moulds
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MacKinnon Steel Company
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Canadian Blower & Forge Co.
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McAvity & Sons, Ltd., T.

Steam Pipe Casing (Wood Stave)
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Burlington Steel Company
Hopkins, & Co. F. H.
MacKinnon Steel Company
Nova Scotia Steel & Coal Co.
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Horton Steel Works, Ltd.
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Hamilton Bridge Works Co.
Horton Steel Works, Ltd.
MacKinnon Steel Company
Standard Steel Construction Co.
Sturtevant, B. F. & Co.
Waterous Engine Works Co.

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Ormsby Company, A. B.

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Britnell & Company
Oakley & Sons, Geo.
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MacKinnon Steel Company
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Standard Steel Construction Co.

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Dake Engine Co.

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Canadian Des Moines Steel Co.
Hamilton Bridge Works Co.
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McGregor & McIntyre
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Tile Drain
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National Fireproofing Co.

Tile Hollow
National Fireproofing Co.

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Hamilton Bridge Works Co.
Horton Steel Works, Ltd.
Standard Steel Construction Co.

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Holt Manufacturing Co.

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Sturtevant, B. F. & Co.

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McAvity & Sons, Ltd., T.
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Ormsby Company, A. B.

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Standard Underground Cable Co., of Canada Ltd.

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Greening Wire Co., B.
Hopkins & Co., F. H.
Leckie Co., John
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BEATTY HOISTS
DERRICK FITTINGS
CLAM SHELL GRABS
ORANGE PEEL GRABS
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CANADIAN MEAD-MORRISON CO
LIMITED
CANADA CEMENT BUILDING
MONTREAL
WORKS: WELLAND ONT.

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Elevators
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Otis-Fensom Elevator Co.
Turnbull Elevator Company

Enameled Brick
American Enameled Brick & Tile Company

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Canadian Ingersoll Rand Co.
Clyde Iron Works Sales Co.
Hopkins & Co., Ltd., F. H.
Inglis Co., John
Laurie & Lamb
Le Roy Company
Sterling Engine Co.
Waterous Engine Works Co.

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Clyde Iron Works Sales Co.

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Milton Hersey Company
Lea, R. S. & W. S.

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Buckeye Traction Ditcher Co.
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Sturtevant, B. F. & Co.

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Crane, Limited
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Clyde Iron Works Sales Co.

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Canadian Ingersoll Rand Co.
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Clyde Iron Works Sales Co.
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McGovern, T. J.
Mussens Limited
Turnbull & Co., Harvard

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Kerr Engine Company
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Hepburn, Ltd., John T.

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Canadian Equipment Co.
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Canadian Equipment Co.
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McGovern, T. J.
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Hamilton Co., Wm.
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Dom. Tar & Chemical Co., Ltd.
[illegible] Company, Ltd
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Pacific Coast Pipe Co.
Vancouver Wood Pipe & Tank Company

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Canadian Johns-Manville Co.

Rails
Gartshore, John J.
Hopkins & Co., Ltd., F. H.
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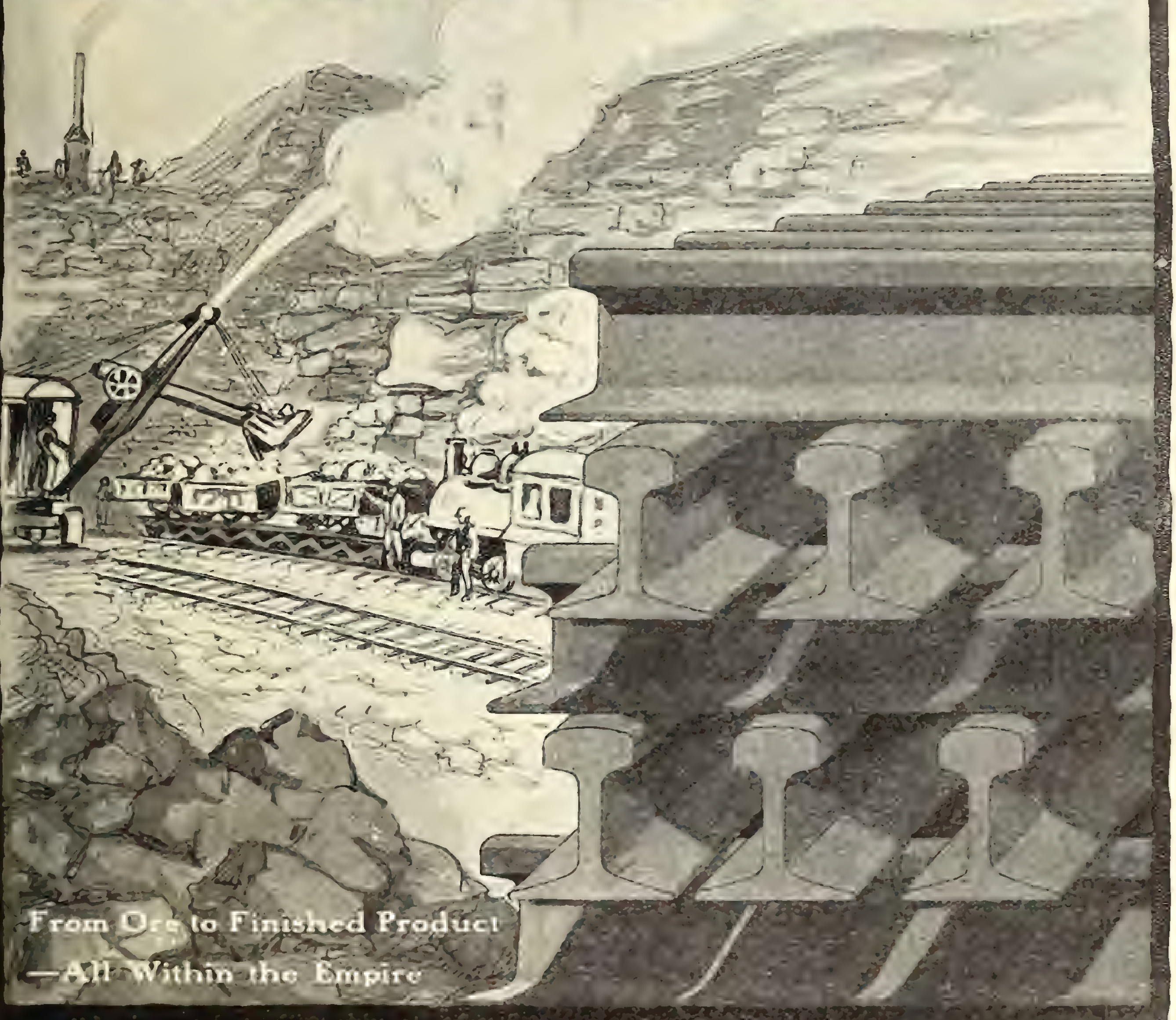
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Published Mar. 7, 1923

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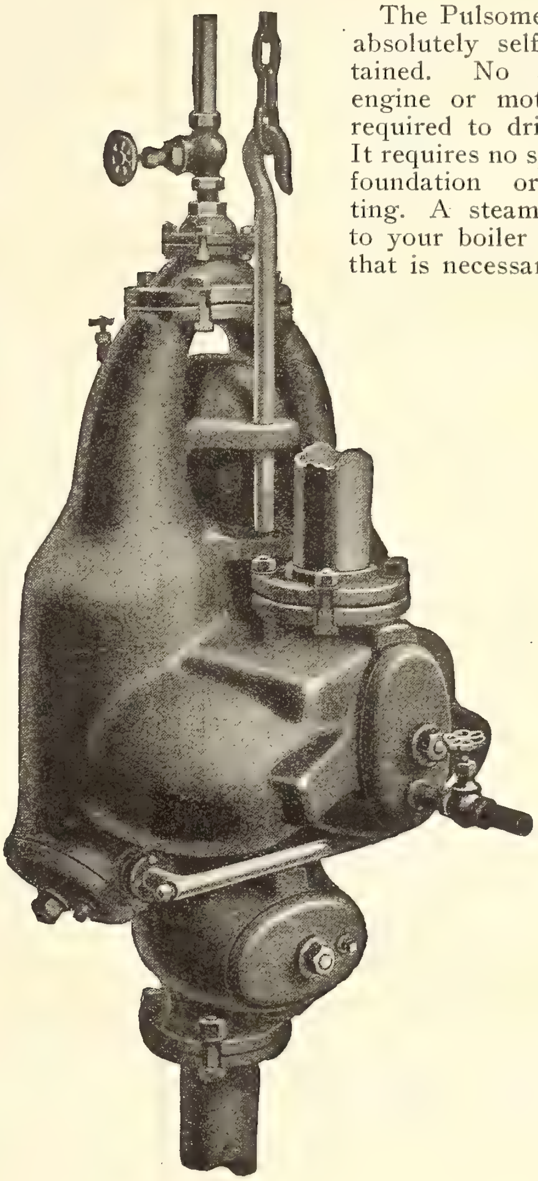

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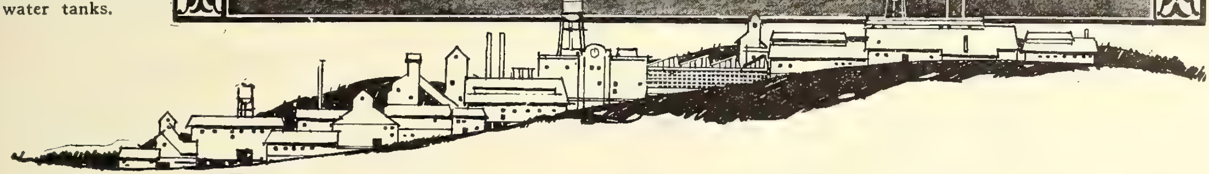

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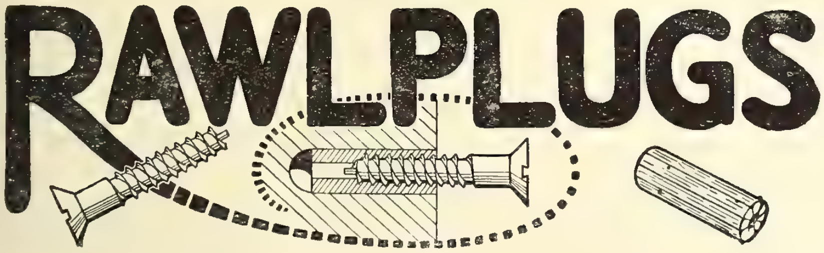

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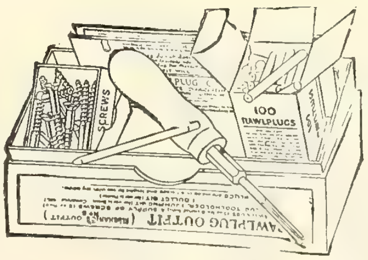

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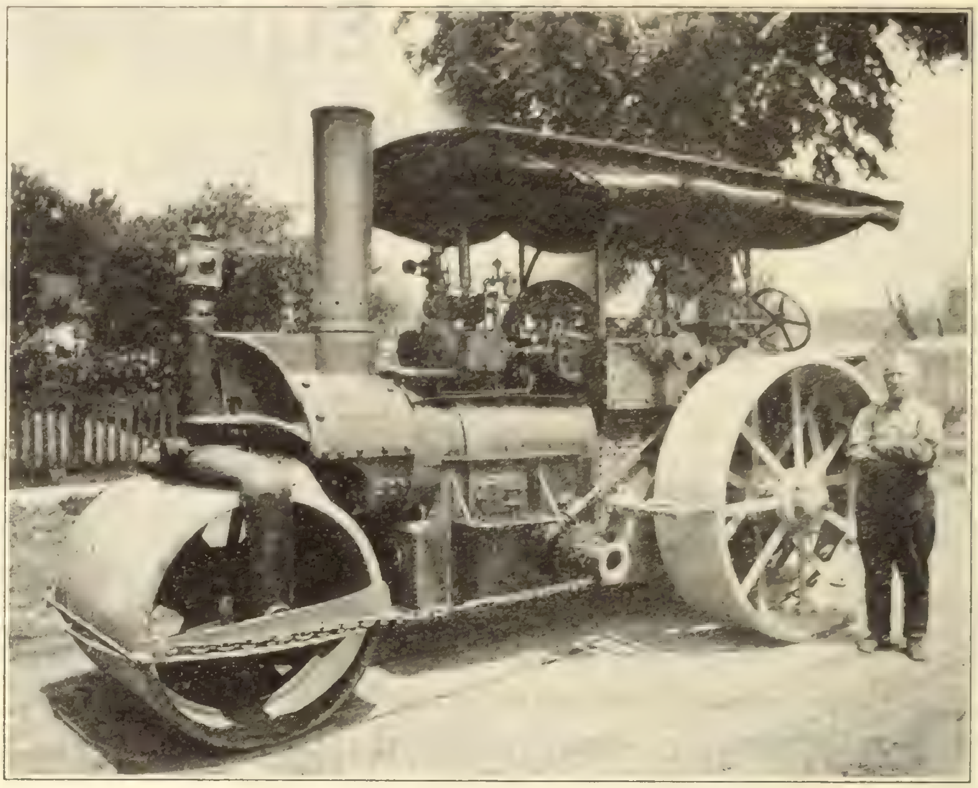

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Are Public Works Being Stifled?

An apparent determination on the part of the Dominion government to set a good example to the rest of Canada in the payment of debts is shown by the figures in Finance Minister Fielding's recent budget. Expenditures called for are less than a year ago by the substantial sum of $51,000,000 which, presumably, will be applied to the reduction of the national debt.

The total expenditures amount to $427,000,000 as compared with $471,000,000, made up of consolidated revenue requirements, four hundred and five millions, and capital requirements of seventeen and three quarter millions. The latter is a million and a quarter less than last year. The expenditures involved are: railways and canals (approximately), twelve and a quarter millions; public works, four and a half millions and public works, marine department, three quarters of a million.

It is gratifying to see the government with its face steadfastly set towards retrenchment in expenditures but it is not clear, considering the urgent needs of our growing country, that capital expenditure on "public works" should have suffered. Surely there are various items of maintenance where the odd million or two could have been better spared. One cannot help wondering sometimes what economies would be effected in this direction if the whole administration of government business and government expenditures were placed in the hands of a business executive of the type of the present head of the Canadian Pacific or the Canadian National railway.

Electrical Resources in Trust for Canada

There are two good reasons why Canadians would much prefer not to import coal from the United States;—(1) It means that somewhere between forty and one hundred and forty million dollars goes out of the country every year (Mr. McGrath's statement) and (2) it acknowledges dependence upon the United States. For these reasons we should do everything in our power to reduce our imports to a minimum.

It is frequently said that the central Canadian provinces can never hope to become independent of United States coal. This may be true, but in any case we can relieve the pressure and live in hope, in the meantime, that we may find some means of utilizing our own fuel—East and West. The cost may be heavy but this will not probably be the determining factor—it may be a question of getting it as any cost. However, it looks at the moment as if we should be driven to use bituminous fuel in constantly greater quantities and it would seem to be necessary that we prepare ourselves for this eventuality. There is no shortage of imported soft coal, though, if we are forced to give up anthracite, we shall probably find a way to use our own fuel resources.

The length of time elapsing before the United States puts the clamps on anthracite export will depend upon the financial profit from the Canadian field and upon the forced necessity for considering our interests. Bearing on the latter point is the supply of electrical energy. There is no thought, of course, that our electric supply from Niagara, the St. Lawrence and all other sources, with every last drop utilized would be any real factor in heating the homes of Ontario, but it is a prime factor in operating our industries. In this direction it is absolutely indispensable. The situation therefore sums itself up in this way: the United States possesses something which is almost essential to us; we in Central Canada possess something that is equally essential to the United States—we are today allowing Canadian power to pass over to the States—we are reciprocating. We expect, and no doubt they expect, to continue to reciprocate. But the extent to which our good neighbors will meet us in this exchange will not be guided by our needs. It will be determined absolutely on the basis of value for value. If we can give little, we may expect little. If we have bigger quantities of power to trade off we can require bigger quantities of coal in return.

The course of our Canadian Governments is clear We must keep possession of every single horsepower the law allows. In spite of aesthetic demands we must, we fear, in the near future, utilize every drop of available water—the pinch of low temperatures will decide that point for us—and we must let no single unit of electrical energy pass across the international border without getting recognition and full value for it. It is not so much who, in Canada, develops this power or who controls it. The point to keep constantly in mind is that it shall be held in trust, and utilized, for all time, every unit of it, for the benefit of the Canadian people and of Canadian industry.

Building Factors and Their Trend

A Graphic Presentation of the Tendencies in Labor and Material Prices and Construction Costs—What is Likely to Develop This Year—Employer and Employee Relations

By E. G. M. CAPE
E. G. M. Cape & Co., General Contractors, Montreal

Presented before the fifth construction conference of the A.C.B.C.I.

In as concise a way as possible I should like to set down figures which bear upon the cost of building materials, cost of building labour, the yearly amount of construction done in Canada, and the average cost of living during the period from 1913 up to the present time. For the purpose of analysis, and in order to present these figures graphically I have prepared a chart, upon which I have drawn five curves. The horizontal co-ordinates of these curves in all cases represent time elapsed since 1913, the figures representing in each case December of the year. The vertical co-ordinates represent the percentage above or below 1913, which in all cases is taken as the standard, or one hundred per cent. It is to be noted that the curves of cost of materials, living and labour run along together in a very regular way during normal times from 1913 back to 1900. It was on the outbreak of war that conditions began to change. Speaking generally, everything went up till a peak was reached about the end of 1920, and from that time until now a readjustment has been taking place. In looking at the probability for building activity during the present year several important elements must be borne in mind. The first is the probable demand of the country for building construction under ordinary conditions; second, the probable cost of building during the coming year as compared with building under ordinary conditions; third, the likelihood of financiers committing themselves to capital expenditures at the present time; and fourth, probable relations between employers and employees.

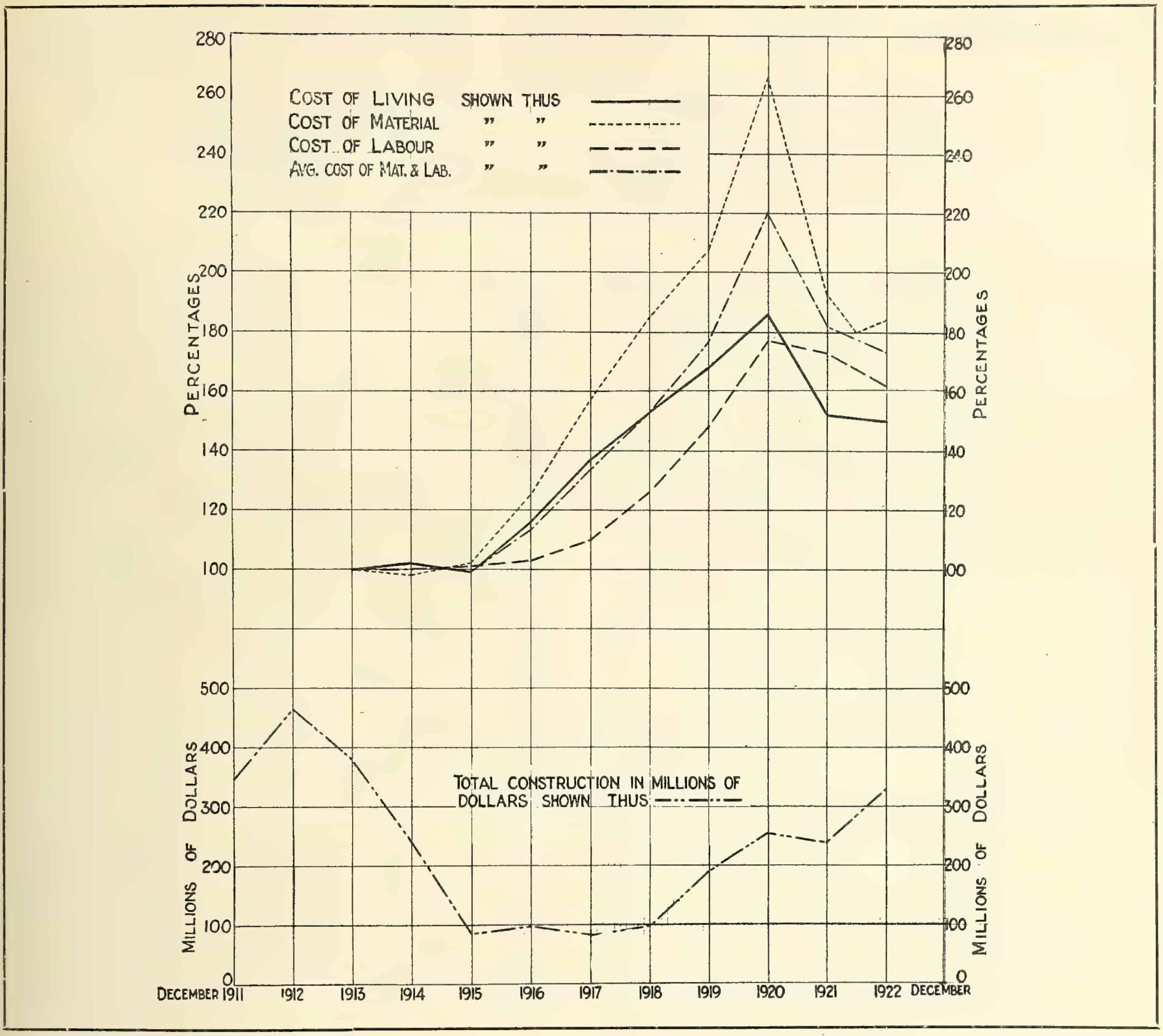
Greater Building Activity in 1923

We will consider first, the probable demand of the country for building construction under ordinary conditions. The lower curve shows the total construction in millions of dollars carried out in Canada from 1911 up to the present time. It will be seen that during the period of war, the value of construction fell from three hundred and eighty millions in 1913 down to eighty-four millions in 1915; that it remained almost stationary at this figure until 1918; and that it has since increased to three hundred and thirty millions at the end of 1922. It would appear from these figures that we are still below normal; and that the tendency is towards an increasing demand in the future. I wrote some time ago to building exchanges in every principal city in Canada, and the answers which I have received show in practically every case that the building exchanges anticipate a greater building activity during 1923.

What will be the probable cost of building during the coming year as compared with building under ordinary conditions. To study this phase, we shall consider the heavy black curve showing the cost of living, which we shall consider as a basis, as it is made up from the statistics of the Department of Labour at Ottawa, and may be taken to represent the average cost of things in general. We shall compare with this curve the curves of the costs of labour and building materials during the same period. The curve showing the cost of materials is made up from figures supplied by MacLean's Building Reports, and it shows the average values of all materials entering into construction during the time in question. The curve of labour is made up in a similar way. From these two curves a curve has been compiled showing the average of the cost of labour and materials, and this may, I think, be taken to fairly approximately represent the comparative costs of building during the time under consideration. During normal times this curve, showing the average cost of labour and materials combined, will be found to follow closely the curve of the cost of living. It will be seen that during the period of the war both rose until a peak was reached about the end of 1920, and that both have fallen and are continuing to fall although with less rapidity during 1922 than they did in 1921. It will be seen that the curve of labour and materials has not yet come down to that of the average cost of living. Until it does, a further long swing reduction in the cost of building would appear to be indicated.

In this connection it is interesting to note that both the cost of labour and the cost of building materials are still high, as compared with the cost of living; and that while the cost of labour is still declining slowly during the past year, the cost of materials seems to have reached a temporary low point about the middle of 1922, and has risen slightly since that time. It should be noted, also, that the cost of building, as shown by the average labour and material curve, has declined slightly during the present year from about eighty-two per cent to seventy-three per cent above normal.

What is the likelihood of financiers committing themselves to capital expenditures at the present time? The dark spot at the present time is the



European outlook. On account of the situation there, it is probable that there will be very little British capital offering itself for investment in Canada. On the other hand, American financiers are taking an increased interest in our country, and it is probable that a large amount of American capital will be available for necessary construction in this country. During the last few months Canadian railroads, which form such an important part in our commercial life, have been coming into the market for large quantities of rolling stock and equipment. The crop throughout Canada last autumn was, taken as a whole, the best we have had for many years and has done much to put our farmers in a stronger financial position. As agriculture is the principal industry in our country, this cannot but have a good effect upon all our industries.

Relations Between Employers and Employees

It would appear from the letters which I have received from the various builders' exchanges throughout the country that labour and capital in the building trades have for the time being realized that it is more important to go on with work than to recommence the contentions which have wasted so much time during the past few years. It appears that there will be little change in the present scale of wages; and that few strikes or lockouts are in contemplation by either party. There are several serious troubles in connection with labour in the building industry which can be remedied to a certain extent.

One is the lost time of building mechanics caused by climatic conditions. At the present time building mechanics work only for a portion of the year and are idle for a great part of the time. This condition can be remedied by educating the public to the fact that it can obtain better prices for its building by calling for tenders at such times as will enable contractors to make greater use of available building mechanics during the slack season. Governments and municipal corporations should be approached with the idea of providing public work during the slack seasons. Another important difficulty in the building labour situation is the shortage of mechanics in various trades, more particularly bricklayers and plasterers. This shortage is due to our lack of having a proper apprenticeship system.

Canadian Water Works Officials Meet for the Discussion of Problems

A Large Attendance of Superintendents, Operators and Equipment Men—Lively Discussions of Practical Points Followed Presentation of Papers—Next Meeting in May

Considerable enthusiasm marked the mid-winter meeting of the Canadian Section of the American Water Works Association, which was held in the Carls-Rite Hotel, Hotel, Toronto, on February 22 and 23. A very large representation of water works officials and suppliers of water works materials were on hand with the result that the proceedings were keenly followed and the discussions participated in with unusual vigor. The papers which were scheduled for presentation were of very practical interest and, judging by the discussions, made a strong appeal to most of those present.

The first business meeting of the association took place on the afternoon of February 22, when two papers were presented, "Water Works Intakes" by Professor R. W. Angus, University of Toronto, and "Preparation of Water for Filtration" by F. A. Dallyn (in collaboration with A. V. DeLaporte) of the Ontario Health Department.

Professor Angus', remarks indicated that the main purpose of a water works intake was to secure an ample fresh, cool and good supply of water. He stressed the importance of each of these factors, particularly the requirement that an intake must provide an abundant supply. He stated that the sources of water were creeks and rivers, wells and springs and lakes. For creek or river sources the intake design was not difficult, unless there was a great fluctuation in the level of the water. Where particular care had to be shown in intake design was in connection with lake sources of water. In this case the intake must keep out all debris and be low enough down to get cold water. The simpliest procedure was to lay the pipe on the bed of the lake, a plan that met with some success but which was not fully effective. The main consideration in design was to make sure that the entrance velocity was low so as to keep foreign matters out of the pipe.

Foreign matters which were most troublesome were ice, weeds and floating materials. Of these, ice was the biggest trouble-maker, largely because it is approximately the same weight as water. Of the three kinds of ice—cake, frazil and anchor—frazil is generally the worst, although anchor ice may become a serious menace in small intakes. Frazil ice will enter the intake if the velocity is high enough and the same is true of cake ice. Almost every intake draws from the surface and the ice is, consequently, often drawn in. In spite of the depth of the intake, Professor Angus declared that ice had a tendency to go down and illustrated the case by reference to the new intake of the Chippawa Power Canal. He also pointed out the cumulative effect of ice gathering in the intake through the increase in velocity which was caused by the closing of the opening.

Types of Cribs

Professor Angus then went on to illustrate the types of cribs for intake purposes. He stated that although there were a large number of the kind that rise above the water, they gave a great deal of trouble with ice, even though the ports were low down, because they drew water from the surface. Enlarging the ports was not always a remedy for the trouble, but the use of a bell mouth entrance often proved effective. The submerged crib was another type that was found to give good service. In this case the bell mouth tended to spread the draft and decrease the velocity. Often a screen was put on top, but that was not very successful because it decreased the area and increased the velocity. The use of a plate over the intake was found by Professor Angus to be desirable, in addition to which the intake should be kept as low as possible and all screening done on shore. In closing, Professor Angus remarked that it was hard to estimate the cost of an intake owing to the many uncertain factors in connection with the construction, but he thought that one would be well repaid by getting a good contractor and paying his price.

Following Professor Angus' address considerable discussion took place, Mr. Gore asking to what extent the question of rotation of the water in the form of a vortex applied to intake work. Professor Angus replied that a vortex always tended to form, which might be overcome by distributing the draft of water over as large an area as possible. Mr. Jennings enquired if an inverted cone over the bell mouth would increase the effectiveness of the intake, the reply being that in any case there was such an inverted cone of still water and that the use of a concrete cone therefore produced no better results.

Ice Trouble

There was a great deal of discussion regarding the matter of ice formation, it being pointed out that frazil was found at depths as low as 50 to 70 ft. in Toronto. The cause of frazil ice was said to be agitation, Mr. Diven pointing out that high winds with a sudden change in temperature caused frazil, inasmuch as surface ice did not tend to form under these conditions. Mr. E. M. Proctor gave a brief outline of cribs that had been put in in the Scarborough water works, near Toronto, pointing out that basswood gaskets are used instead of rubber. On the question of flanges, some discussion took place, Professor Angus indicating that cast steel flanges were preferable to rolled steel for pipes over 6 ft. in diameter.

The paper on "Preparation of Water for Filtration" prepared by A. V. DeLaporte and F. A. Dallyn, of the Provincial Board of Health's Department, will be referred to at greater length in another issue. It brought up a number of points on which a great deal of discussion took place, largely centering around the efficiency of the drifting sand filter. The discussion was participated in by Messrs. Gore, Howard, Dobbin, Sanderson, Storrie and Dallyn.

At the meeting some points were brought up in connection with the new regulations of the Ontario Department of Health regarding the installation of dual check valves in buildings where there was fire protection service. Mr. Dallyn, of the department, pointed out that the metal seated valve had failed to be of service and manufactureres would not quote now on metal to metal fittings. The F. M. type was found to be so much more satisfactory that it was preferable and the extra expense of such valves was not as much as the labor cost of changing the seat of metal to metal valves. Mr. Dallyn did not consider it a defect of the valve itself but rather of the seat.

In the evening, the Toronto branch of the Engineering Institute of Canada had a joint meeting with the Canadian section of the American Water Works Association for the purpose of discussing a paper by Mr. Norman J. Howard, on "Methods of Purifying Public Water Supplies," which was presented a few weeks ago before the Engineering Institute of Canada. A widespread and profitable discussion took place.

Water Works Records

At the session on Friday, the first paper was one on "Water Works Records and Accounting," by Mr. Henderson, of the Peterboro Utilities Commission. It was an explanation of the methods adopted in Peterboro for the recording of all information relating to water service and the billing of consumers. More reference will be made to this paper in a subsequent issue.

"Chlorination Apparatus and Its Control" was the subject of a very excellent paper by G. A. H. Burn and A. E. Berry, This paper is reprinted elsewhere in this issue.

In the afternoon, two papers were presented "Special Water Works Tools and Equipment," by Alex. Milne and "Application and Operation of Gasoline Auxiliary Pumps," by S. L. Fear, M.E. The latter was a description of a large number of lantern slides and indicated some of the essential features of gasoline engines, hydraulic pumps and other similar equipment of interest to water works men. Another issue will contain more detailed reference to this particular paper.

Mr. Milne's paper is reprinted elsewhere in this issue. It was productive of a great deal of discussion, participated in by Messrs. Brown, Miller, Starr, Buchanan and Wynne-Roberts.

On the whole the meeting was a most outstanding success, as it brought together a very large number of water works officials for a mutual discussion of their problems. Another similar meeting is scheduled to take place in Windsor next May, just prior to the large annual convention of the parent association.

Exhibitors of Equipment at the Convention

The display of the **Neptune Meter Co. Ltd.,** of Toronto, comprised some of their line of Trident water meters and parts, with some cut open models to show working parts.

The **Canadian Des Moines Steel Co.,** Chatham, showed a large number of photographs of tanks and structural steel jobs for which the firm was responsible.

The **Nicholls Chemical Company,** of Toronto and Montreal had on display samples of various chemicals of interest to water works men, including filter alum and chloride of lime. Hard-N-Tyte, a preparation for hardening concrete, was also shown.

The **Canada Metal Company,** of Toronto, had a large display of metals and alloys which this concern manufactures, including lead, tin, solder, phosphor bronze, Harris metal, etc.

Horton Steel Works, Ltd., of Bridgeburg, Ont., manufacturers and erectors of water tanks, etc., were also represented, their exhibit consisting largely of photographs of several of their large tank installations for industrial and municipal purposes.

The exhibit of the **Canadian Wood Pipe Co. Ltd.,** of Vancouver, B. C., consisted of several samples of their wood pipe, with steel double coupling and specially treated double burlap jacket. The latter feature is the most recent improvement in wood pipe manufacturing and, it is claimed, doubles the life of the pipe. The burlap is saturated in tar and asphaltum and is wound, double ply, on the wood pipe by machine.

B. & S. H. Thompson & Co. Ltd., of Montreal showed several samples of their products including "Hippo" Concrete Floor Hardener and "Hippo" Foundation Coating, in various applications.

Crane Limited, of Montreal, were present with a very complete array of valves, fittings and other water works equipment. They distributed an interesting booklet entitled "Plumbing Suggestions for Home Builders" which showed their very extensive and up-to-date line of plumbing and heating equipment.

The **Arthur S. Leitch Company,** sales engineers, of Toronto, were represented and featured "Roberts" and "Nash" lines of water works equipment for which they are Canadian agents. Some excellent photographs of Coffin valves and sluice gate units were also displayed at their booth.

A feature of special interest at the booth of the **Canadian Lock Joint Pipe Co.,** of Toronto, was the showing of a miniature moving picture film, depicting the entire process of manufacture of reinforced concrete pipe for water supply lines. In addition to this feature, many excellent photographs of various installations were on display.

The **Grasseli Chemical Company,** of Toronto, showed samples of liquid chlorine, chloride of lime and sulphate of alumina at their exhibit.

Several samples of pipe specials were shown at the display of the **Standard Foundry & Supply Co.,** of Walkerville.

Wallace & Tiernan, Ltd., of Toronto, manufacturers of chlorine control apparatus, had a booth at the exhibit and capable representatives were always on hand to explain the operation of the W & T chlorinating equipment for the protection of water supplies.

Samples of the De Lavaud centrifugally cast iron pipe were shown at the **National Iron Corporation's** exhibit.

The **Grinnell Company of Canada, Ltd.,** displayed their well-known line of water works fittings and interesting booklets on their products were distributed.

The **Thomson Meter Company,** of Brooklyn, had a booth at the exhibit and showed their "Lambert" line of frost proof, current, current duplex and disc water meters. A little booklet, including price list, was distributed.

Another firm displaying valves, fittings and miscellaneous water works equipment was the **Canadian Brass Co. Ltd.**, of Toronto.

The **W. J. Westaway Co. Ltd.**, of Hamilton, Canadian representatives of the Permutit Company, of New York, distributed literature describing the latter company's water softener plant for homes and industrial plants.

The **General Supply Company,** Ottawa, were present, representing the A. P. Smith Company and the Renssalaer Valve Company, and showed several of these companies' products, including valves, tools and water works supplies.

Those lines of interest to water works men, manufactured by the **James Morrison Brass Mfg. Company,** of Toronto, were displayed at this company's large booth and many interesting little booklets were distributed.

Page Hersey Tubes, Ltd., of Toronto, showed samples of their buttwelded and lapwelded steel pipe and their wrought iron pipe in various dimensions and finishes. A handy booklet, containing specifications and prices on these various lines, was distributed.

The display of the **Mueller Mfg. Co. Ltd.,** of Sarnia, Ont., occupied considerable space in the exhibition hall, and featured their tapping and drilling machines in actual operation.

At the **Gartshore Thompson Pipe & Foundry Company's** exhibit were shown samples of their cast iron pipe, flanged pipe, flanged tees, bends and various special castings.

Jenkins Bros. Ltd., of Montreal, featured the Dean control unit for motor operation and valve control and a pamphlet outlining the advantages of this type of valve control was distributed. A valve was on display equipped with the Dean Control Unit.

Allen General Supplies, Ltd., of Toronto, representing the **Builders' Iron Foundry,** showed this company's well known line of "Venturi" meters and equipment.

Perhaps the largest display at the exhibit was that of **Francis Hankin & Co. Ltd.,** of Montreal and Toronto, consisting of water works plant equipment and supplies. Many excellent photographs of various units installed were shown also.

The **Northern Foundry & Machine Co. Ltd.,** of Sault Ste. Marie, Ont., featured pumping equipment at their display, but also showed valves, fittings, etc.

List of Delegates in Attendance

Active

A. J. Mylrea, Toronto; W. H. Randall, Toronto; Alex. Milne, St. Catharines; A. M. Bowman, Elmira, Ont.; R. O. Wynne-Roberts, Toronto; L. Kenneth R. Wilson, Brantford; Geo. G. Routlege, Toronto; Geo. H. Mitchell, Toronto; A. E. Berry, Toronto; J. G. Archibald, Woodstock; W. B. Redfern, Toronto; E. V. Buchanan, London; Thos. Hodkinson, Toronto; B. R. McKenzie, Windsor; T. E. Ferris, Niagara Falls; G. G. Powell, Toronto; Jas. J. Salmond, Toronto; W. E. Macdonald Ottawa; C. D. Brown, Walkerville; R. L. Dobbin, Peterborough; R. H. Starr, Orillia; H. G. Hunter, Montreal; F. A. Dallyn, Toronto; J. M. Diven, New York; Mrs. J. M. Diven, New York; F. A. Early, Brampton; W. H. Hammond, Lindsay; James Buxall, Lindsay; R. H. Myers, Stratford; C. H. Bromley, Grimsby; W. G. Henderson, Peterborough; D. M. Hanna, Windsor; William Storrie, Toronto; William Gore, Toronto; R. C. Harris, Toronto; Chas. Warder, Niagara Falls; W. J. Howard, Toronto; A. Sanderson, Toronto; E. M. Proctor, Toronto; L. D. Walker, Toronto; R. W. Angus, Toronto; A. Collins, Niagara Falls; A. G. Peirson, Weston; Frank Hannan, Toronto; C. E. Sisson, Peterborough; P. H. Cowan, Galt.

Visitors

L. W. Wynne-Roberts, Chatham; Leston Kirkwood, Simcoe; H. A. Babcock, Toronto; Jas. Currie, Kingston; W. L. McFaul, Hamilton; J. P. MacDonald, Toronto; Geo. N. Millward, Port Hope; D. B. McWilliams, C.E., Toronto; R. N. Austin, Toronto; E. V. Tillson, Tillsonburg; Geo. D. Tillson, Tillsonburg; J. R. Jackson, Toronto; C. E. Hogarth, Toronto; C. D. Roberts, Toronto; Alex. Brown, Walkerville; E. W. Johnston, Toronto; B. C. Smith, Oshawa, Ont.; H. G. Hall, Ingersoll; C. H. Henze, Walkerville; W. M. Wimderlich, Burwell, Neb.; Jas. Bain, Hamilton; Thomas Towers, Hamilton; Hubert Kennedy, Montreal; Ch. Francois; Jancy (France); E. H. Darling, Hamilton; W. W. Marshall, Orangeville; Hugh Kellner, Windsor; W. M. Walker, Windsor; S. Worsencroft, Peterborough; W. G. Hunt, Peterborough; C. H. R. Fuller, Chatham; J. Clark Keith, Windsor; Jas. A. Thomson, Hamilton; W. C. Miller, St. Thomas; G. E. Chandler, Toronto; M. A. Toolny, Toronto.

Associate-Manufacturers

M. A. Shrader, H. Mueller Mfg. Co. Ltd.; W. T. Randall, Neptune Meter Co. Ltd.; N. Twaith, H. Mueller Mfg. Co. Ltd., Sarnia; H. B. Savage, H. Mueller Mfg. Co. Ltd., Sarnia; Roy Right, Francis Hankin & Co. Ltd.; H. O. Kerr, Kerr Engine Co. Ltd., Walkerville; M. Miners, H. Mueller Mfg. Co. Ltd.; G. F. Johnston, Canadian Des Moines Steel Co. Ltd., Chatham; P. Macrae, Victaulic Pipe Joints; E. R. Case, Victaulic Pipe Joints; H. M. Marsh, W. J. Westaway Co., Hamilton; E. A. Humphries, Engineering Journal; N. E. J. Sheppard, Engineering Journal; F. R. Hamilton, Drummond McCall & Co.; J. S. Clemens, Canadian Brass Co.; S. S. Gear, Horton Steel Works, Bridgeburg; W. E. West, Page Hersey Tubes Ltd.; H. K. Gee, Jenkins Bros. Limited; J. Hughes, Jenkins Bros. Limited; F. W. Hudson, National Iron Corp. Ltd.; A. S. Branston, Empire Brass Mfg. Co.; J. E. Monaghan, Grinnell Co. of Canada; J. H. Ryding, Crane Ltd.; J. McCartney, Canadian Brass Co.; H. Wiseby Bragg, Municipal Review of Canada; J. C. Richardson, Grasselli Chemical Co.; L. D. Wilkes, Allen General Supplies Ltd.; J. P. Russell, "Contract Record," Toronto; A. E. Jennings, "Canadian Engineer," Toronto; W. G. Chace, Canada Lock Joint Pipe Ltd., Toronto; W. H. Randall, Neptune Meter Co.; A. Betton, The Jas. Morrison Brass Mfg. Co. Ltd., Toronto; C. J. Blythe, Canada Metal Co.; J. C. Powell, Canada Metal Co.; P. Arrison, Thomson Meter Co., Brooklyn, N.Y.; T. M. Jones, Northern Foundry & Machinery Co. Ltd.; J. VanBens Chotru, Wallace & Tiernan Co. Ltd., Toronto; J. H. Dougherty, General Supply Co. of Canada Ltd.; R. H. Zovitz, General Supply Co. of Canada Ltd.; C. Glove, Northern Foundry & Machinery Co. Ltd.; H. D. Cameron, The Nichols Chemical Co. Ltd.; B. B. Charles,

(Continued on page 201)

Chlorination Apparatus and Control

An Effective Means of Sterilization

A Description of the Apparatus Used for the Treatment of Water with Liquid Chlorine—A Universally Accepted and Highly Efficient Way of Rendering Water Sterile

By G. A. H. BURN and A. E. BERRY
Sanitary Engineering Division, Provincial Board of Health of Ontario

The use of chlorine as an agent in the purification of public water supplies is a development of the past two decades. Following its introduction to this Continent in 1908 as a sterilizing agent in the treatment of municipal water supplies its efficiency was quickly realized by waterworks authorities. The first installations were designed to use calcium hypochlorite only. As the necessity for more adequate protection of municipal supplies became evident, and the field of usefulness for chlorine in water purification widened the process gradually developed from one using chloride of lime to present day liquid chlorinators. The extensive use of this process is well indicated by the fact that today in the Province of Ontario the municipal water supplies, which are protected either wholly or in part by chlorination equipment represent over 80% of all water supplied to municipalities for domestic consumption. At the present time there are over 2,000 liquid chlorine machines in operation in the United States.

Calcium Hypochlorite—commonly known as bleeching powder, or chloride of lime—is produced by the action of chlorine gas on slaked lime in lead lined chambers. The gas itself was originally manufactured by chemical means, but the present day method consists in the electrolytic decomposition of salt brine. Coincident with the development of the electrolytic method came the development of machinery for liquifying the gas so that it could be readily transported, as it is today, in steel cylinders.

Bleeching Powder Apparatus

The original bleaching powder equipment, and that normally used today consists essentially of a primary mixing tank, in which the powder is mixed with water, either by hand or by mechanical means, and a secondary solution tank from which the clear liquid containing the available chlorine is fed through a small orifice at a definite rate. This solution may be introduced directly to the supply, or may first be diluted with more water to facilitate thorough mixing with the water under treatment.

One of the chief disadvantages in the use of this bleaching powder method is due to the variation in the strength of the powder. Chloride of lime, as prepared by the manufacturer contains as an average 35% by weight of available free chlorine, but this figure is far from standard, and is often considerably lower. When large containers or drums are allowed to stand exposed to the atmosphere, or only partially covered the chlorine content rapidly diminishes. These figures do not hold at all for bleach supplied in paper cartons where the available free chlorine is often as low as 10%. The waterworks plant where the daily requirement of bleach is small must either run the risk or loss in strength through the lengthy exposure of a large container, or use small cartons of low chlorine content. Where the operator has no practical means at his disposal for estimating the chlorine content of the bleach, he must rely upon the flexibility of the orifice discharge to obtain the correct dosage. The use of bleach of a low chlorine content mixed in water in the same proportion by weight as the stronger powder will necessitate a more rapid discharge through the orifice, which in turn require chlorine solution tanks with greater storage capacity to last the desired period.

A further decided disadvantage in the use of chloride of lime is due to the difficulties encountered in the preparation and handling of the solution. The chlorine fumes from full strength powder are most disagreeable to the operator, and will also rapidly corrode and deteriorate nearby machinery unless it be well protected. The corrosive action on the orifices, which are of necessity small renders uniform operation extremely difficult where metal parts are used. Constant supervision is required to prevent continual clogging due to small particles of lime in the solution. In those municipalities where the pumps are left to operate in the absence of an attendant, this method will not ensure safe treatment of the supply. It should be regarded more as a temporary device to be used only until a liquid chlorine machine can be put in operation.

Liquid Chlorine Machines

The difficulties met with in the use of Chloride of Lime are for the most part overcome by liquid chlorination equipment. The development of these machines has now reached a point where the apparatus has become so perfected as to make possible the application of an exceedingly uniform dosage, and one which can be conveniently adjusted to fulfill the requirements of the particular water.

The great majority of the municipalities of this Province who are using liquid chlorine in the treatment of their water supplies are provided with machines of a similar make, namely, the "Wallace & Tiernan." In view of this a description of the main parts, with their functions of this make only, will be considered. Other machines now on the market include the Patterson Chloronome—Canadian Agents, Laurie & Lamb, Montreal, and the Candy machine, with the Francis Hankin Company as Canadian representatives. While these machines very considerably in detail from the "Wallace & Tiernan," they are designed under the same general principles with main parts intended for similar functions.

Component Parts

The chief parts of a liquid chlorine machine are as follows:—

1. The Cylinder of Chlorine
2. The Compensator
3. Gas Measuring Devices
4. The Mixing and Feeding Equipment

The Cylinder of Chlorine

The chlorine supplied to the waterworks station is in a liquid condition due to the high pressure in the container. The steel cylinders are of two sizes, containing 100 and 150 pounds of chlorine respectively. Although the liquid chlorine in these is practically pure some foreign substances are very often present, and unless this is first blown off by slightly opening the tank valve in the top of the cylinder clogging of the small orifices may occur. The auxiliary tank valves are made in two different styles—the "yoke" and the "union." In view of this it would be advisable for plant operators to procure both styles, so that regardless of from what company the chlorine was purchased no difficulty would be experienced in making the connection to the tank. The chlorine from the cylinder passes through an auxiliary tank valve, and a flexible metal connection to the pressure compensator.

The Pressure Compensator

The purpose of the pressure compensator is twofold; first, to reduce the pressure of the chlorine supply leaving the cylinder, and second to maintain a constant delivery of chlorine under varying tank pressures resulting from two factors:

1. Reduction in the amount of chlorine in the cylinder.
2. Variations in temperature.

As the amount of chlorine in the cylinder decreases the pressure falls off considerably, especially in this the case when the cylinder is nearly empty. The pressure in the cylinder is very materially affected by the temperature of the room. Pressure variations range from about 75 pounds at 50 deg. F. to 150 pounds at 95 deg. F. The common practice is to adjust the pressure from the compensator to 25 pounds.

The compensator is a somewhat complex piece of mechanism, and so constructed as to be very sensitive to slight changes in pressure. The gas entering the compensator is throttled by a Tungsten needle point valve actuated by a silver diaphragm, which is held in position by adjusted springs, and operated by the pressure variation on the diaphragm. The release of the pressure on one side following the opening of the chlorine control valve causes the spring and chlorine pressure on the opposite side of the diaphragm to move the latter, which in turn raises the needle off its seat, allowing the chlorine gas to flow through the opening.

Variations in the capacity of machine is met by varying the size of the compensator seat and container. These are made in four sizes. The first size has a capacity that will pass 20 pounds of chlorine per 24 hours, and is used only on the Solution "A" type machines.

The second size will pass up to 75 pounds.

The third size up to 200 pounds, while the fourth has a capacity from 300 pounds per 24 hours.

The sensitiveness of the various machines is not from 0 to their capacity, but only over a stated range, which bears a definite relation to the final orifice.

In case of emergency due to failure of the compensator to function properly it may be removed, and chlorine fed directly to the orifice, or gas measuring device, and the rate adjusted by the auxiliary tank valve on the small Solution "A" type. On all other types of machines a jumper valve can be inserted in place of the compensator, and the flow of gas adjusted by a control valve. This does not give nearly a uniform feed, and will require constant supervision and adjustment of the valve opening to meet the changes of pressure in the chlorine cylinder. Some of these fluctuations can be overcome by enclosing the cylinder of chlorine so as to maintain a somewhat constant temperature.

Gas Measuring Devices

For measuring the amount of gas passing through the apparatus different methods can be used, depending on the type of machine. On the smaller equipment a volumetric method is adopted. This consists of either of two types, namely, a bubbler for a capacity of from 1/100 to 3/4 of a pound of chlorine per day, and the syphon or pulsating meter for a capacity of from 1/2 to 10 pounds per 24 hours. Both these are used only on the small machines—(Solution "A" type). The amount of chlorine passing the machine is estimated either by the number of bubbles in the former or the number of pulsations in the latter in comparison with a table supplied with the equipment.

On the larger machines the gas is measured by a glass orifice used in conjunction with a manometer. These orifices are made of a size suitable for the particular dosage capacity of the machine, and should bear a particular relation to the needle point valve of the compensator. The glass orifices are calibrated empirically, and a calibration scale should accompany each orifice. These scales are numbered the same as that etched on the glass orifice. The orifice and scale are interchangeable with any machine where the compensator needle valve and seating have been made for a capacity similar to that of the orifice.

The rate flow of gas is indicated by the manometer, whose principle of operation is one indicating the drop in pressure of the gas passing through the orifice. This device is made up of a small tube with bottom end open in a larger one. A liquid carbon tetrachloride is placed in the manometer, and when the chlorine begins to flow this liquid rises in the inner tube, and the rate of flow is indicated on the scale. The pressure in the larger tube is that of the gas before passing the orifice while that in the inner tube is the pressure of the gas after passing the orifice. This difference in pressure which registers the actual working pressure of the orifice causes the manometer liquid to rise in the inner tube, and the corresponding flow is indicated on the scale.

Mixing and Feeding Equipment

In some of the older and direct feed type installations the chlorine gas was fed through a duffuser directly to the suction main or pump well, but the present practice is to dissolve the gas in water before feeding it to the supply. Where the bubbler or pulsating meter is used the gas is dissolved in the mixing jar surrounding the meter. Where a manometer is used the gas may be dissolved either in a separate solution jar, or in an injector.

Injectors

Injectors are now used very largely on chlorinators. The principle made use of is that a supply of water is passed at a high velocity through a narrow throat and in doing so sucks in chlorine gas through a small opening. The injector is very advantageous in that it is of substantial construction, and not easily broken, and can be used where small pressures occur on the suction side of the pumps. They work successfully, where the water pressure available is three times as great as that against which the chlorine solution is to be introduced. The throat of injectors are universally made of vulcanized rubber. A screen placed in front of the injector prevents clogging.

Water Pressure Reducing Valve

A water pressure reducing valve is usually placed on the water line leading to the injector. It reduces the pressure to a convenient figure for operation of the injector, and keeps it uniform regardless of varying pressures in the main.

Chlorine Check Valve

The chlorine check valve is an essential part of every chlorinator. Its function is twofold. First, it prevents the possibility of water backing up into the chlorinator, and thus eliminates subsequent corrosion It also acts as a check against the escape of chlorine until a definite pressure, usually about 25 pounds has been built up in the machine. This serves to maintain uniformity of discharge through the orifice or pulsating meter.

The essential parts of the check valve are a reinforced silver corrugated disc, to which is attached a tungsten needle, and the back pressure valve seat and container. As the pressure of the chlorine gas builds up against this disc it pushes it upwards, and raises the needle from its seat, which in turn allows the escape of gas through the orifice.

The back pressure valve seat and container is made in two sizes, the smaller has a capacity up to 100 pounds per 24 hours, and the larger up to 300 pounds.

Feed Devices

Conditions about the waterworks plant will influence largely the point at which the application of the chlorine to the supply is to be made. It can either be delivered to the pump suction well, or directly to the suction main. The advantages of the former lie in the possibility of a more uniform mixing. The most suitable point in the well for delivery of the chlorine solution appears to be directly in front of the pipe carrying water to the well. This will ensure a thorough mixing of chlorine with all parts of the raw water. When the chlorine can be fed only to the suction main difficulty may be experienced where there are many separate suction lines. Alteration in the dosage, however, can be more quickly noted when the method is fed. To feed the solution to the suction pipe a special corporation cock and silver solution tube is used. This permits of the closing of the corporation cock before the solution tube is entirely withdrawn.

Water Seal

The majority of chlorinators are provided with water seals through which a small amount of water is allowed to flow continually. This device is intended to serve two purposes:—

1. To prevent air getting into the pumps, when the suction is temporarily greater than is supplied by the chlorine solution.
2. To carry off the chlorine in case of loss of pressure of water, or an insufficient supply of water in the mixing chamber to properly dissolve the gas.

While a water seal is undoubtedly of particular advantage it might well be so designed as to provide a supply of water, which will always be adequate and yet prevent any overflowing.

Automatic Control of Chlorinators

While the manufacturers have provided equipment for the automatic control of chlorination the use of this in smaller installations is of doubtful advantage because of the delicacy of the mechanism and the difficulty of having operators sufficiently trained to make minor repairs. It is most desirable, however, that every waterworks system be provided with a venturi meter to enable the operator to know at all times the rate of pumpage.

The Pedestal or Vacuum Type

Recently a new vacuum type of chlorinator has been put on the market, which is entirely different in principle of operation and design than any previous equipment. This type gives much promise of overcoming the difficulties experienced in the operation of the old type units. The machine is extremely rugged in construction and the several delicate and often troublesome features of former types have been entirely eliminated, such as the pressure compensator, control and blow-off valves, manometers, check valves etc.

Instead of being designed to work under a pressure of chlorine as is the case with former types this unit functions under a vacuum, a feature, which immediately minimizes the nuisance of chlorine leaks.

The vacuum is maintained within a transparent and water-sealed glass dome by the flow of water through a hydraulic injector attached to the base of a vulcanite tray on which the inverted glass dome rests.

Under the glass dome but connected directly to the chlorine supply is a chlorine pressure reducing valve consisting only of a needle valve and hard rubber float. The chlorine supply is reduced in passing this needle valve from full tank pressure to a slight vacuum and the action of this part in conjunction with other units serves as a compensator in maintaining a constant delivery of chlorine, regardless of fluctuating temperature and pressure of the chlorine supply.

The flow of chlorine is varied by increasing and decreasing the vacuum within the glass dome, this latter operation being accomplished by an adjustable silver meter tube which is in turn directly connected to a large rack and hand-wheel, all of which is enclosed within the cast-iron base of the pedestal.

Factors Affecting the Control of Chlorination

The conditions affecting the control of water chlorination vary considerably in the different waterworks plants. Under those conditions where the pumpage is continuous over 24 hours of the day and the supply is fed directly to the mains rather than to a reservoir or elevated tank, difficulty is encountered in providing uniformity of treatment owing to the variations in the consumption throughout the 24 hour period. If the supply is unmetered the plant operator can only make a rough estimate of the hourly consumption. Very large municipalities are able to take care of this fluctuation by the setting of the machine. Smaller ones should be provided with an elevated tank or reservoir as a means of economy. The difficulties in the variation of pumpage in small installations may be overcome by placing a pressure relief valve on the discharge side of the pump and providing a by-pass to waste or to some part using water at a lower pressure.

In some of the smaller municipalities where a reservoir or elevated tank is included in the system the service pumps frequently have a large capacity and are operated for only a short period each day. The rate of pumpage here is normally quite uniform, but the operator and those officials purchasing new machines, should bear in mind the fact that the daily consumption is pumped in at a high rate and that sufficient chlorine must be applied to sterilize the water at this hourly rate. The size of orifices in the chlorinator should correspond to the capacity of the pumps rather than to the daily consumption. As a result of these conditions and the previous lack of knowledge of the chlorine requirements of the water, instances have occurred at Haileybury and Timmins in the North where machines of too small a capacity to effectively chlorinate the supply have been installed, and were afterwards removed.

Fire Supply and Dual Supplies

Practically all waterworks are provided with service and fire pumps, the latter of which are used in case of fire only. Normally the chlorine dosage is set for the service rate. In case the fire pumps are put into operation the dosage should be immediately increased to meet this rate. The operator should know through consultation with the Provincial Board of Health, as a reasonable protection against his liability in a Court action, the rate at which chlorine should be applied to fire supplies. Where the fire supply is unfortunately obtained from a separate source, regulations now require the provision of dual check valves, or adequate storage tanks to provide for fire conditions.

Meters

All public water supply systems should have a venturi meter for recording the consumption. The plant operator can then check up variations in the rate of consumption and adjust his chlorine dosage, when necessary. Knowing definitely this increase or decrease, he can at once regulate the dosage and will not be required to make such frequent tests upon the treated supply to determine whether or not he is adding the correct amount of chlorine.

Chlorine Dosage

Changes in the physical and chemical characteristics of the water supply itself have to be considered in controlling the chlorine dosage. Chlorine is a very active substance chemically and in addition to its germicidal action in destroying bacteria it is absorbed by certain substances, which may be present in the raw water, either in suspension or solution. Municipalities which have supplies derived from springs, wells or lakes where there is very little change in the dissolved and suspended solids of the supply will not find any great variation in the organic demand of the raw water. Other supplies, which are subjected to wide range in turbidity, color, amount or dissolved organic matter or amount of industrial waste pollution will be found to require varying amounts of chlorine to maintain sterility in the tap water. Increases in turbidity inhibit the sterilizing action of chlorine and, in addition, the suspended matter, causing the turbidity, usually contains a percentage of organic matter, which reacts with chlorine. Hence increases in turbidity inhibit the sterilizing action of chlorine ine applied. The highly colored waters which are characteristic of many of the Northern Municipal supplies require large amounts of chlorine (often between 2 and 3 parts per million) to meet this demand of the organic content. Plant operators, who are called upon to treat supplies, whose physicial and chemical characteristics vary considerably should request the co-operation of the Provincial Board of Health in making a study of the chlorine dosage.

The many factors which directly or indirectly affect the amount of chlorine which must be applied to ensure a safe water, make it impractical to arbitrarily adopt an exact dosage to be applied at all times. During the earlier period of chlorination the dosage was frequently set upon the advice of the manufacturers of chlorine equipment. This tended to an under dosage, 1/10 p.p.m. being a common figure.

Fortunately the correct dosage of chlorine, which will produce a water of recognized quality is always associated with a residual chlorine and the dosage may be regulated by the residual rather than the bacteriological test.

With this end in view the Provincial Board of Health of Ontario has made available the ortho-tolidin method for the detection of free chlorine. This method has been chosen on account of its simplicity, delicacy (as small an amount of chlorine as one part in one hundred million can be detected) and definite ranges of color, which are produced, thus enabling the adoption of permanent standards.

The o-tolidin solution reacts with any free chlorine in the water tested producing a characteristic yellow color, which is compared with standards prepared with the potassium and copper sulphate solutions.

Numerous research experiments have established the fact that the sterilizing section of chlorine is practically complete after 15 minutes contact. Acting upon this basis the Provincial Board of Health has adopted the standard that for all doubtful water supplies where chlorine alone is used, there shall be maintained a residual chlorine content of not more than ·3 p.p.m. and not less than .2 p.p.m. after fifteen minutes contact.

The minimum color standard is prepared by using 20 c.c. of standard potassium bichromate solution and 1.9 c.c. of standard copper sulphate solution, which is made up to 100 c.c. with the water, which is being treated. The maximum color standard is made in the same manner except that 30 c.c. of the potassium bichromate solution is used.

To perform the test a Nessler tube is filled to the 100 c.c. mark with tap water procured as close to the point of application of the chlorine solution as possible. This is allowed to stand for 15 minutes when 1 c.c. of the o-tolidin solution is added to it. It is now allowed to stand for a further 5 minutes to give the o-tolidin a chance to react with all the available chlorine present. In the meantime the two standards are poured into two other Nessler tubes. After the 5 minute period has elapsed, the depth of color produced in the tap sample treated with o-tolidin is compared with the standard by looking down through them over a sheet of white paper. The resulting color in the treated tap sample should have a depth not less than that of the minimum standard and not greater than that of the maximum. If this is not the case, adjustment of the chlorine dosage is necessary. If the color is deeper than the maximum, then the dosage must be reduced and vice versa. After the tests are completed the standards should be poured back into bottles provided for the purpose, care being taken that they are not mixed and the Nessler tubes should be rinsed out.

A close check upon the amount of chlorine added to the water is necessary not only to ensure a sterile supply but, also, to eliminate the complaints, which sometimes arise as a result of overdose.

The greatest objection that has been raised against the chlorination of water, has been the production of tastes and odors in certain supplies. These tastes and odors may be roughly attributed to two causes,—

(1) An excess of free chlorine.

(2) Combinations of free chlorine with complex organic compounds or certain industrial waste compounds, forming highly complicated substances, the exact nature of which is not definitely known, but which impart a very disagreeable taste to the water.

Tastes and odors due to excess chlorine with the present day knowledge and equipment should rarely occur. Undoubtedly many of the troubles of the early bleaching powder installations were due to lack of adequate means for feeding the solution at a uniform rate or in proportion to the water treated; to the failure to determine the actual strength of the chemical, or to the failure to make tests for residual chlorine on the treated water. The supplanting of the older method by liquid chlorine has done away with many of these difficulties, but even yet, tastes and odors sometimes arise, where proper attention is not given to making the doses follow closely the variations in the quality of the water treated or in the rate of pumpage.

There are many instances on record of tastes and odors arising from the second cause, the majority of which arise out of contamination of a supply with trade wastes, containing a certain phenolic content content e.g. wastes arising from the destructive distillation of coal and wood. The solution of this problem at present appears to lie in the retention of all such offensive material on the premises of the offending parties. It is a difficult matter to remove such taste once it occurs and it is, therefore, best to prohibit the pollution of water supplies by such wastes.

Several obscure tastes mentioned in the literature have not been referred to here as these occur only under conditions peculiar to certain supplies.

Special Water Works Equipment

A Few Important Devices That Save the Time of the Water Works Department

Locators for Leaks and Underground Fixtures, Thawing Apparatus, Meter Testers, Pneumatic Appliances and Trench Tools

By ALEX. MILNE
Superintendent of Water Works, St. Catharines, Ont.

The topic under discussion in this paper has been classified for convenience in handling as follows:

1. Wireless pipe locator.
2. Magnetic needle for locating boxes, etc.
3. Electric leak locator.
4. Thawing apparatus—steam and electric.
5. Pipe jacks.
6. Leadite, Metalium, etc.
7. Tapping machines.
8. Meter testing, portable and stationary apparatus.
9. Portable air tools for caulking, tamping, back fills, cutting roadways, rock work, etc.
10. Trench excavators.

In the majority of well organized water works systems, complete records are (or should be) kept of the location of all piping valves, etc., but occasionally these records do get mixed and the exact location of a fitting is not known, except perhaps to the man who laid it forty or more years ago, and who may have passed to another sphere of operations. In such cases the wireless pipe locator has proved a boon to many operators. The word "wireless" is rather a misnomer in the operation which, while quite a simple one, is performed by means of a set of 4, 8, or 12 dry cells, depending on the length and size of mains you put in circuit, a high frequency buzzer, some light copper wire, and an induction coil connected by an insulated wire to a sensitive receiver fitted to a head piece. The process is to place your "lost" pipe within a certain circuit made by connecting to two fixtures on the mains, couple the battery and buzzer anywhere on the wire circuit line, turn on the current, adjust the buzzer contact to obtain the loudest sound, then adjust the head-piece receiver, hold the induction coil at arm's length towards the ground. A loud buzzing will be heard everywhere within the produced circuit except when the coil is immediately above the pipe, which once being found, can be followed by swinging the coil right and left across the pipe, and the exact location readily determined. Many hours labor in hunting with pick and shovel may be saved by a ten minute operation of the instrument, and as is natural, after a few practice operations the operator will soon become proficient in its use.

The Magnetic Dipping Needle

The magnetic dipping needle is another simple little instrument whose relation to erratic records of location bears more particularly on valve and service boxes, which sometimes get covered up in pavement construction by careless contractors, change of grades, etc. It is a very useful instrument in such cases. The speaker has had them for several years, and found them a great time saver in locating the exact position of street boxes, even where covered by ice, earth or concrete to the depth of twelve inches or more.

Leak Locator

The electric leak locator is also very valuable in locating leaks particularly under paved streets where the water will sometimes follow the soft fill of the trench many feet before finding an outlet along the curb or gutter. This is another type of wireless apparatus, but unlike the pipe locator, it has no wiring or attachment to the piping. The outfit consists of a two-cell battery intensifier connected to a sensitive receiving disc or microphone mounted on a metal base plate, with tripod and a receiver somewhat similar to the locator. The operation of the machine is purely by vibration and it does its work well. In case of a leak in a joint under the pavement, you simply slide the tripod along and you will have no trouble in determining when directly over the leak, the sound being very clear and distinct, even though the main be six to eight feet down.

Thawing Apparatus

In the earlier days of his experience, the writer thawed out frozen services with a small hand pump, a pail and hot water from the householder's teakettle and 40 to 60 feet of ⅛" pipe,—sometimes a rather tedious operation. In 1902, very severe weather brought an epidemic of freeze-ups and we had a boiler maker make up a steam boiler, 22" diam., 30" long with 4 vertical flues, fitted with inlet and outlet valves, steam gauge, and safety valve. This was mounted on a lead melting fire pot and with 50 feet of ½" steam hose and the ⅛" brass pipe did efficient service for several winters. The boiler was operated at 75 to 100 pounds pressure and where the services were accessible in basements, without elbows, it took only a few minutes to thaw 25 to 40 feet of pipe, but often much longer to warm up the 2½ feet of lead goose-neck. Many cities today use equipment of this type in larger size, transported on truck or sleigh, which gives efficient service in thawing pipes, hydrants, catch basins, etc.

The more modern method, however, for thawing frozen service pipes or mains is by the use of electric current, which after considerable experimental work is now practically standardized as to equipment.

The writer uses a specially made 20 kw. transformer, 2,200 to 220-110-55 volts, with oil-immersed rheostat for controlling the amount of current, taking the current from the primary 2,200. For ordinary service thawing where only a short distance of main is in circuit, he has found 55 volts at 175 to 225 amperes to be most efficient, the average period of application being about six minutes to start the water flowing. This outfit, with about 1,000 feet of No. 6 wire is carried on a light truck or sleigh, and the operating crew consists of a lineman obtained from the power company to make the primary connections, and three men from the water department for the work on the ground, this crew thawing from 15 to 30 services in a day. In some instances three or more are thawed from one primary connection, while frozen services at long distances from a 2,200 line have caused considerable loss of time and expense to reach.

A rather unique and efficient outfit is now obtainable which places the water department independent of the electric companies, viz., a small generator coupled direct to a gasoline motor, which can be mounted on a truck, and, having its entire equipment as a unit, will doubtless prove very serviceable, particularly in districts remote from electric service.

The more recent apparatus advertised (with which the writer is now experimenting) claimed by the makers to be efficient, although slower, takes the current from the house wiring at 115 volts to a transformer, reducing it to 11 volts, the claim being made that an ordinary service can be thawed in 15 to 20 minutes. This, while slower than the results from higher voltage, is offset by the reduced cost of outfit and operating crew, and the facility of making connections, the whole outfit being readily carried if need be by two men.

In electrical thawing, as in all electrical work the prime factor is in making proper contacts with wires to the house piping or fixtures.

Pipe Pushing Jacks

Due to the construction of permanent pavements, the necessity for tools of this type is fast becoming more evident, the roadways departments naturally objecting to the frequent cutting of pavements. Even when so cut, the cost of replacement is an expensive item in construction or maintenance of piping; hence any tool that will economically drill, bore for or force a pipe through the soil under a roadway becomes a labor saving and cost saver.

The writer's experience has been that the pushing jack can be profitably used in any sandy or loamy soil which can be dug with a spade or shovel, but he did not find it useful in hard stratified clays, or in gravelly soils with large stones or hard pan formations, the clay soils being bored with a 2½" augur, and the coarse stoney gravel dug out. If the soil is too hard, there is always the danger of using too great a pressure and thereby causing splitting of the pipe used.

Leadite and Composite Joints

This portion of the topic is one of which the writer cannot speak from personal experience, although he has seen these jointing materials being used and has seen mains laid with them when uncovered after several years service. No special tools were in evidence in the handling of the materials used, just the ordinary fire and melting pot, ladles, etc., being used, the only difference noted being in the building up of the pouring mould to a height of several inches above the joint, when after pouring and cooling the sprue was broken off flush with the hub of the pipe. The prime factor was said to be the proper temperature of the material when poured.

Tapping Machines for Service and Mains

The use of the service tapping machine has become so general in recent years that it seems needless to elaborate on its many advantages over the old method of making connections to the main, where not infrequently several blocks of water had to be shut off while the main was drilled. If the old style drive cock was used, and not properly driven, or a careless laborer touched it with his foot or shovel, the not infrequent result was a trench filled with water to be pumped and the whole operation repeated, while numerous angry consumers expressed their opinions of the department and its staff in language not generally published. There are a number of different makes of these machines on the market today, each claiming their good points, any of which will render good service if intelligently operated and taken care of, and no water works system can afford to be without their use where continuous service and economical operation is to be maintained.

Main tapping machines are also equally necessary in the operation of a water works system where continuous service and fire protection is to be furnished to the community. The writer was the first user of this machine in Ontario, and still uses the first one imported (having been well taken care of it looks good for another twenty years of service). Of the many connections so made during that period, not one has required any attention, connections being made on sizes 6″ to 36″ in some instances, where, without the use of the machine, the work would have entailed the shutting off the entire supply for a period of three to six hours under the most favorable operations, and perhaps much longer should a bad hand cut of a 24″ or 36″ have been made,—a condition that should not be tolerated in modern service and one which our friends the underwriters would quickly and justly resent should a fire occur in the meantime. The operation of the machine is very simple, and the cost of the connection is only slightly, if any, more than the cutting out and connecting a branch, while the element of safety from fire danger and continuity of service is a factor not to be estimated in a few dollars.

May I add as a small item of history in connection with this subject. The main tapping machine was invented and developed in present form by one of the earliest and most enthusiastic members of the Association—the late Anthony P. Smith, at that time engineer and superintendent of Water Works at Newark, N. J. His ideas were quickened by an occurrence in his work very much similar to the possible condition before recited. Having occasion to make an 8″ connection to a 16″ main for a fire service line to a large industrial plant, the water was shut off the 16″ for several blocks in the then customary way, and the slow work of cutting out that 16″ pipe, pumping out, etc., was in progress with, I presume, the full equipment of tools to be had in a progressive city, but before the job was half completed a serious fire occurred in the works, resulting in the almost total loss of the plant before the water could be turned on. Spurred on by the criticism which naturally followed he at once set to work and evolved the tapping machine, shortly after leaving the water works department and devoting his entire time to the development and production of the main and service tapping machines, and valve inserting machines which bear his name.

Meter Testing

Thirty years ago to install a meter on a consumer's line usually meant invoking a storm of abuse on the head of the superintendent or official who was trying to get a record of the water used on that particular service, and the old slogan—still often used —was that the meter was the only means of properly fixing a rate whereby every consumer paid only for what he used. But does he always do so when the meter is set? Not unless regular and proper checking and inspection of the meters are made. In making this assertion no reflection is implied on any of the meters now on the market, but it is simply intimated that a meter, like any other piece of mechanism, will deteriorate with service, and a meter, like any other measuring or weighing device, should be kept as nearly correct as is possible, in justice to both the seller and purchaser. The proper knowledge of this condition can only be had by regular periodic tests of all meters, which may be done by two methods customarily employed, viz.

(A). The use of a portable test meter of small size which may be coupled up to the service meter on the inside and the water wasted by a short section of hose to the sewer. These test meters may be had from any of the meter manufacturers, and for the smallest domestic service meters are a very convenient and efficient method of checking such meters, the accuracy of the test meter being readily proven by running a measured test on it at any time.

(B). For the larger sized meters, however, a more accurate test may be had by using one of the many shop testing outfits now in general use, where both slow, small and volume tests can be made and accurately checked by both weight and measurement.

Portable Air Compressors

To the operator whose work is mostly in the smaller sized mains—with few pavements or rock work, this may not appeal very strongly, but on the larger systems, where mains of 12″ and upwards are to be laid, pavements to be cut, backfilling tamped properly and economically, the portable air compressor is a great labor and time saver, and produces infinitely better results than can be had by hand work on the larger sized mains.

These portable compressors are now made by several firms in sizes from 20 feet of air per minute upwards, strong compact and serviceable requiring but very little attention and very economical as to operative cost.

In caulking, 30 feet of air will operate two hammers, which on large sized mains will do the work of six to eight men, and do it much better. In cutting pavements one heavy hammer with proper tools will perform the work of a dozen or more laborers with sledge and drill or picks.

Trenching Machines

Where soil and other conditions permit their operation, the trenching machine has become a very important factor in trench excavation, both as to cost per foot and amount of work done, compared with manual excavation under present day labor results.

There are several of these machines on the market, all being good for their respective sized work from the smallest rotary, digging a drain 12″ x 36″ for conduit laying to the more ponderous largest sized "leg" machine cutting a trench 5′ x 24′ or more, while one machine with drag line equipment, is limited in width and depth of cut only by the size of bucket and length of cable with which it is fitted.

Delegates in Attendance

(Continued from page 194)

The Nichols Chemical Co. Ltd.; James Noble, The James Morrison Brass Co.; C. E. Williams, The James Morrison Brass Co.; C. J. Dunseith, Allen General Supplies Ltd.; E. Bruce Wilson, National Meter Co. of Canada Ltd.; K. T. Lockhart, B. & S. H. Thompson.

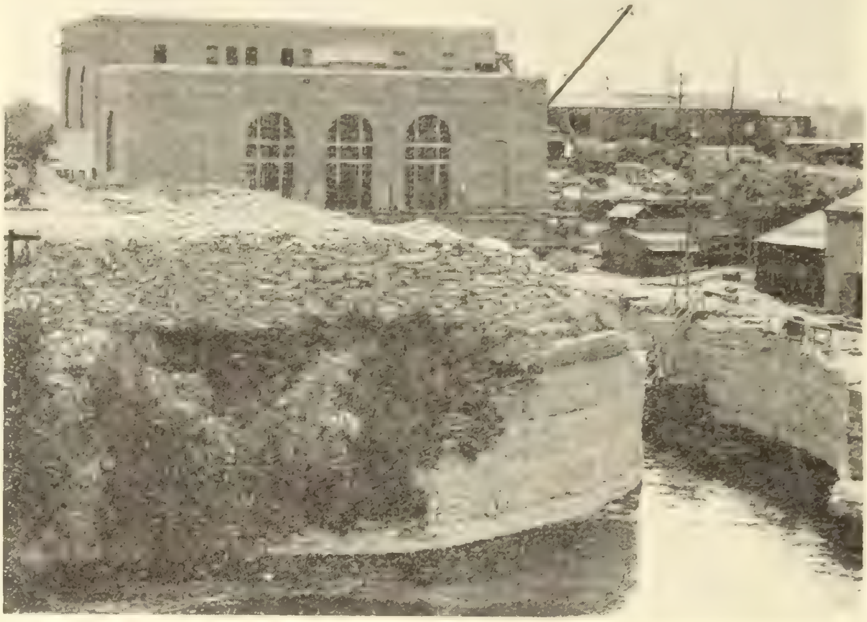


Fig. 1—Power house and tail race of Ranney's Falls development. Tail race channel is a vertical side rock cut.

Trent River Development Yields 10,000 h.p. to Central Ontario

Ranney's Falls Power House Latest Addition to H.E.P.C. Chain of Seven Stations in This District—Two Vertical Units—Different Types of Draft Tubes—Switchboard Features and Wiring Layout

A new hydro-electric generating station of 10,000 horsepower was recently put into operation at Ranney's Falls on the Trent River. This station is the most recent addition to a chain of seven developments that supply energy to the Central Ontario system of the Hydro-electric Power Commission of Ontario.

The operating head is 48 feet, derived from the difference in levels of the Trent Valley Canal and the Trent River, near Dam No. 10. When the canal was constructed provision was made for future development at this point by the building of two intake sluices in the channel wall. These are located immediately above locks 11 and 12, and convey the water to the turbines.

An open forebay, 124 ft. in length, connects the sluices to the power house. The regulated canal level at this point is 447.0 (sea level datum.) From the power house the trailrace, 30 ft. in width, extends 275 ft. to the Trent River, the level of which at the junction with the tailrace, is 429.0. The forebay is 116 ft. wide by 12 ft. deep at the intake. The side walls converge and the forebay increases in depth until at the gatehouse the dimensions are 71 ft. wide by 24 ft. deep. This design is conducive to low velocity at the racks.

The gate house substructure is a block of reinforced concrete, 84 ft. by 30 ft., in plan. There are four entry chambers, two for each unit, 14 ft. in width. The racks are at the head of these, and built of structural steel in two sections. In the centre pier of the gate house a 5 x 4 ft. chute is provided to carry off any ice or other floating material from the forebay.

The double supply pipes connecting the gate house to the turbine cases are each provided with a gate of the "Stoney" type, one gate for each unit being of the sliding type, and the other of the rolling type. The supply pipes are of re-

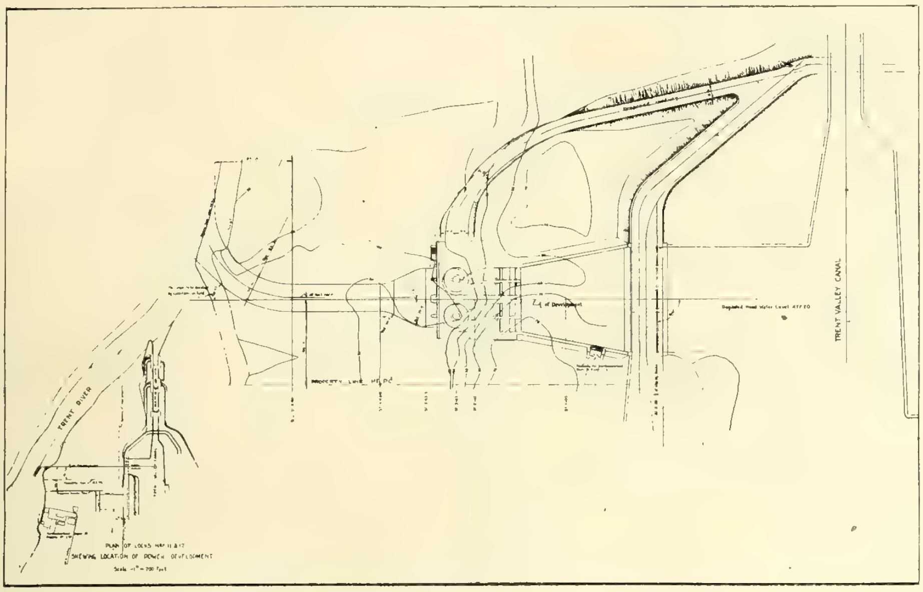


Fig. 2—General plan of development showing relative position of plant and locks 11 and 12.

inforced concrete. The double supply pipes converge at the bottom, leading the water to the turbine scroll cases in the proper direction, with minimum eddy loss.

Two Designs of Draft Tube

The two turbines are of the vertical single runner type, each direct connected to a 4,500 kv.a. generator. They were supplied by the Boving Hydraulic & Engineering Co. and each have a rating of 5,000 h.p. at 120 r.p.m., when operating under 47 ft. head. No. 1 turbine is equipped with a Moody spreading draft tube. No. 2 turbine is equipped with a tube built in accordance with the design of the turbine manufacturers. The turbines are controlled by Woodward oil pressure governors. The governor oil pressure is supplied by two motor driven pumps. The piping is arranged so that either pump may operate both governors, if necessary.

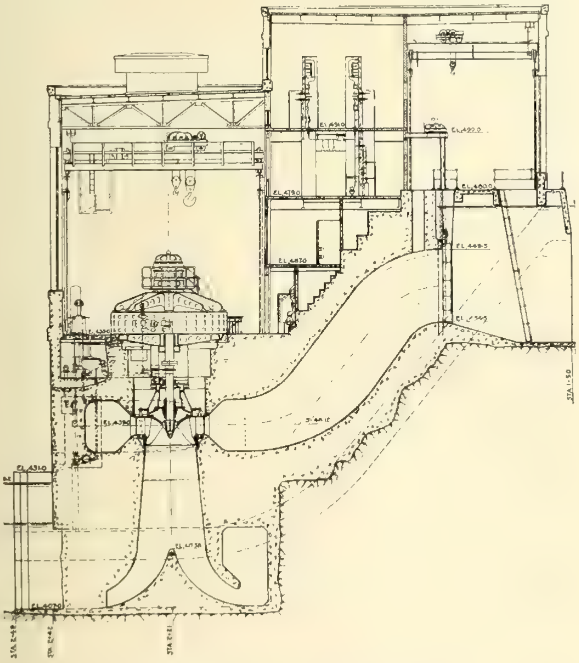


Fig. 3—Section through one unit

For test purposes a sharp crested weir has been built in the tailrace, about 130 ft. from the power house. Piezometer openings have also been left in the scroll cases for carrying out tests by the Gibson method.

The structure and walls up to the sills of the large arched windows are re-inforced concrete. Above this point the walls are built of squared stone masonry. The interior finish is plaster over hollow-tile, except in the gate house, where the plaster is applied to the stone work. Most of the stone in the walls was obtained from the tailrace excavation.

Generators Have Large Excess Rating

The two generators were supplied and erected by the Canadian General Electric Co. These machines are normally rated at 4,500 kv.a., 3 phase, 60 cycle, 6,600 volts, 120 r.p.m., at 80 per cent. power-factor; but are capable of carrying 5,300 kv.a. at 80 per cent. power-factor, with cooling air, at an ambient temperature of 15 degrees centigrade. The rotor is designed so that no fan blades are required to force cooling air through the windings. The cooling air after passing through the generator will be re-circulated and used in winter time for heating the station.

A Review of Water Supply Practice

A Synopsis of the Outstanding Developments of the Past Year from a British Viewpoint—New Ideas in Water Works Structures and in Water Treatment

To England many waterworks engineers and officials look for leadership in matters pertaining to the supply of water. That is because British waterworks men have contributed a great deal to the present knowledge which we have and are constantly on the alert to discover and perfect new ideas. It is interesting, therefore, to study a review of water supply progress in Britain during the past year and for that reason, there is reprinted herewith, with the courtesy of "The Surveyor," a synopsis of British practice, with occasional references to American developments that are of outstanding importance. This review follows:

Although there is some improvement in the general condition, it cannot be said that work in this country has been going forward well during the past year. Some of the larger works which have been under consideration or under construction for some years have made progress, some have reached completion while others are delayed owing to the difficulties of the present time. A certain number of smaller works have gone forward, and it is upon them that most of the work has been done. With regard to the delay of work we proceed in a vicious circle. The work cannot be put in hand while prices are high, and the manufacturers cannot reduce their prices to the expected level because lack of trade results in overwhelming establishment charges.

With every indication that an energetic water supply policy is required, very little progress has been made during the year 1922. The reason for this unsatisfactory condition is largely the extraordinary ignorance of the general public, including our politicians, in matters relating to this very important subject. At a time when it is necessary to use our brains and to apply the whole of our available energy in order to put the country into an efficient condition, we are allowing things to drift in a manner which entails very great waste of public money and which is one of the many factors of trade depression and unemployment. If a householder or property owner impoverished by the late war deliberately allowed his water supply arrangements to fall into disrepair, drew his supply from several sources by expensive and inefficient means, risked his health by using polluted water and further involved himself in a series of lawsuits, when by making necessary alterations he could obtain a good supply from a single source and thereby save a good deal of money, he would be considered to be without intelligence. Yet this example illustrates the condition of this country as a whole.

Every water engineer knows that our present system is most wasteful and unsatisfactory, productive of litigation and a hindrance to work which is urgently required. The Water Power Resources Committee have dealt with the matter fully, and the need for action is admitted by all those who know anything about the subject. Still little progress is made, and it is certain that little will be done until the general public have a better grasp of the situation. The public have come to regard the provision of an abundant supply of fresh water much in the same way as they regard an abundant supply of fresh air. They are quite unaware that it is a manufactured product of limited quality, and that its production involves great work and expense which may be extravagant or economical, and which depends entirely upon the manner in which the supply is obtained and delivered to the consumer.

The Lesson of History

History shows that no great change or advance in water supply has ever been made till trouble has occurred. The trouble which is occurring now is an enormous waste of public money plus a rapidly increasing shortage of supply, with sickness or risk of sickness in rural districts where no public supply exists or can exist for want of proper combination and allocation of supplies. The underground supplies are being used up and wasted by mining operations, and the upland gathering grounds are being appropriated in such a manner that various localities and communities are being left without their natural source of supply. Many schemes are wasteful, there is much needless duplication and the conflict of various interests leads to constant expense. [Here follows some references to legal and legislative aspects of water supplies which we omit as being of purely local interest.—Ed.]

Work for the Commission

Mr. W. J. E. Binnie, in his presidential address to the Institution of Water Engineers, considered the kind of work that might be undertaken by voluntary workers. He pointed out the lack of knowledge concerning the flow of streams and rivers. It is seldom that gaugings are available from which the yield of the drainage area can be ascertained. Calculations have to be made based on the extent of the drainage area, the average rainfall, and the loss by evaporation, but there are many important areas in Great Britain to which we must look in the future for our supplies where no rain gauges have been established. Accurate means of determining the total run-off seldom exist. Mr. Binnie attached great importance to the possibility that the Institution of Water Engineers working with the British Waterworks Association, together representing nearly all the important water undertakings of the country, might arrange that gauges should be provided by the water authorities, and if this could be achieved a great deal of very valuable information might no doubt be obtained.

The question of compensation water was also dealt with. The practice of imposing an obligation of discharging large quantities of compensation water into streams whether it was needed or not is wasteful and needs revision. Mr. Binnie dealt with this matter very fully, giving various instances illustrating the case; he was of the opinion that owing to the greatly increased cost of the works necessary to give the compensation water, and to the increasing difficulty of providing water supplies for our large towns, it is a question which requires very careful consideration on broader lines than hitherto given by the Parliamentary Committee before whom the Water Bills are brought.

With regard to underground supplies, it was shown that the law as it now stands gives no protection to water authorities, so that after expensive works have been carried out there is nothing to prevent a private individual or company sinking a well immediately adjacent thereto by means of which the community may be deprived of its water supply. Other points of equal importance were also mentioned, and the great desirability of gathering information for general use with regard to underground water was emphasized. So much public money is wasted in the unsuccessful and sometimes ill-advised attempts to obtain an underground water supply that the advantage of being able to obtain access to all available records is clear. Mr. Binnie did well to point out that waste of money does occur in ill-advised attempts of this kind. If the number of failures were known it is probable that water authorities and private persons would frequently be less ready to attempt to obtain an underground supply. Mr. Binnie also reviewed Parliamentary procedure.

Concrete Structures

A great deal of attention has recently been given to the fact that the generally accepted data for structural design ignores the stresses set up owing to reduction in volume of concrete on setting and maturing. Mr. H. C. Ritchie, in his excellent paper read before the Institution of Water Engineers, showed that the design of water retaining structures in reinforced concrete presents special problems which are not covered by the British architects' recommendations or by the London County Council regulations, and that such structures as reservoirs or conduits, even though designed in strict compliance with such data, may be anything but satisfactory.

The author shows that the general theory of design based upon the assumption that concrete offers no resistance to tensile stress assumes that steel rods may be stressed up to 16,000 lb. per sq. in., and that the moduli of elasticity of both steel and concrete are constant, so that the modular ratio is constant, and this value is taken at from 10 to 15 for concrete used, also it follows that before the 16,000 lb. per sq. in. stress on the reinforcement can be reached the concrete surrounding the steel must have cracked, as the corresponding stress in this concrete will be in excess of 1,000 lb. per sq. in., thus with steel stresses approaching the maximum generally permitted minute cracking of the concrete occurs which is of such a character as to produce leakage, hence many troubles have occurred. The author would therefore reduce the permissible stress of the steel to about 11,000 or 12,000 lb. per sq. in., at which he has obtained good results.

Copper Expansion Joints

With regard to cracking due to contraction of the concrete, Mr. Ritchie proved his point conclusively that this must occur; moreover it is well known in general practice that such cracks always do occur. He is of opinion that expansion joints should occur at more frequent intervals than is generally considered necessary, say, from 25 ft. to 30 ft. apart. In one of the designs given in the paper a bent lead plate having a U bend between adjoining blocks is shown. In the discussion which followed the reading of the paper, Mr. Ritchie's views were strongly supported. Mr. Fred. J. Dixon, of South Staffordshire, said that although a good many engineers did not believe in expansion joints, there was not a masonry dam in the country or a gravity wall that he had examined in which he had not seen cracks. He said that he had taken the precaution of using expansion joints. Mr. F. Storr said that as to expansion joints of lead, such as had been mentioned by the author, in the works he had been associated with he had invariably specified copper, following the American practice; nearly all the great dams built in the Adirondack Mountains were built in blocks with expansion joints in between. Mr. H. P. Hill said he had adopted a type of expansion joint very similar to that shown by Mr. Ritchie, and he gave an important instance of a reservoir at Lincoln developing serious contraction cracks. With regard to the copper expansion joint, it is interesting to note that the committee of the American Concrete Institute, in a report published in February, 1922, pointed out the extreme importance both for economical and structural reasons of the development of an effective expansion joint, and recommended a 16-oz. sheet-copper joint of similar type to the lead joint shown by Mr. Ritchie.

Mr. J. Waldo Smith, chief engineer of the Board of Water Supply, in a paper describing the Catskill Waterworks stated that in order to prevent the occurrence of temperature cracks in the masonry of the great dams such as the Kensioo Dam, the greatest height of which is 307 ft. the work was divided into sections by transverse contraction joints, so that the interval between joints was well within the distance at which the occurrence of cracks was likely to occur, and that the contraction joints were formed by building vertical faces of concrete blocks shaped as a tongue-and-groove joint, with a flexible copper strip 7 by 1/16 in. thick across the joint to act as a water stop, and these joints had proved to be remarkably tight, a vertical inspection well being made in the thickness of the dam at each contraction joint so that any seepage could be noted. This method of construction wherein transverse contraction joints divide each dam into vertical sections is the outstanding feature of the work.

Mr. H. J. F. Gourley also in his paper read before the Institution of Water Engineers dealing with concrete core walls for earth embankments stated that many engineers hesitate to use a plain concrete core wall fearing that a settlement following the saturation of the up-stream half of the embankment may cause the wall to move and crack, but that contraction cracks could certainly be obviated by copper strip expansion joints, and that such joints would probably serve also to meet any movement crack.

Metropolitan Water Board

One of the most important events of the year was the publication of Sir Alexander Houston's sixteenth annual report to the Metropolitan Water Board. Professor Whipple, of the Harvard Engineering School, has justly stated that "these reports occupy a place in waterworks literature unique in themselves, and for this reason have always been awaited with interest and admiration on the part of those who are fortunate enough to receive them." The chlorination of Thames water, New River water, Chelsea filtered water, and water from the chalk wells, has been carried out with great success. The author deals also with the future of chlorination, and is able to do so with a knowledge and accuracy of description illustrated by his past and present work, which is such as to make the information unique in character. The results of the treatment are excellent, great economy has been effected, experimental work has been successful and there is every promise of a continuance of good results and of progressive improvement. Very little is said with regard to mechanical filters, such as are mentioned below, but there are indications in the report that the mechanical filter is likely to play an important part in the future of purification of the London water.

The greatness of the London water supply may be gathered from the fact that the average daily quantity provided directly to consumers is nearly 155 million gallons from the Thames, 45½ million gallons from the Lea, and about 54 million gallons from other sources, making in all about 255 million gallons per day. In addition to this, water has to be supplied to outside districts. The bulk of this water has to be carefully purified and the whole must be kept under constant inspection. It is probable that we see here the best example of the combined work of the engineer and scientist in water treatment and the chief cause of our good health.

Mechanical filters dealing with a maximum quantity of two million gallons of water per day have been installed at the Waltham Abbey Pumping Station, and have been working since May. These are twelve 8 ft. 3 in. diameter Candy Iron Removing Polarite Filters. This installation is very important because it is the first complete mechanical filter plant erected by the Metropolitan Water Board, and tends to show the probable future policy. It is to be gathered from Sir Alexander Houston's recent reports that the mechanical filter is receiving consideration, and, moreover, that he appreciates the possibilities of its use in connection with the London supply.

Combined Effort

A lecture delivered by Sir Alexander Houston before the Institution of Water Engineers deals with methods of filtration, and purification by storage, gives chemical and bacteriological results, and deals also with questions of taste, remedial treatment, and sterilization by various methods. The engineer and the chemist ought to work more closely together, and this consideration of Dr. Houston's work by the Institution of Water Engineers was most desirable and necessary. The lecture was fully discussed.

In order to have a proper grasp of the problems presented by water supply it is necessary to understand that it depends upon the work of the engineer, the chemist, bacteriologist, geologist, lawyer, legislator, and the financial experts, to name a few of those concerned. The engineer is still inclined to ignore many of the possibilities brought forward so clearly by Sir Alexander Houston. While we all agree that an unimpeachable source of water supply is best, we are beginning to learn that in many cases this is a counsel of perfection impossible of attainment. Water resources are limited, and we have to do the best we can with those which are available. We are forced, moreover, to consider the financial outlook, and we find that we can no longer sacrifice a supply because its quality is unsatisfactory. It is becoming more and more important for water engineers to study the work of the chemist, and for this reason the Institution of Water Engineers are to be congratulated on, and commended for, Sir Alexander Houston's most important discussion of the subject. If all those concerned in this all-important matter of water supply were to confer together and to become aware how greatly the work of the one is dependent upon the other, many difficulties would be overcome and the treatment of the subject, as a whole, instead of in sections, would follow.

Valuation and Rating

The valuation and rating of water undertakings was discussed in a paper read by Mr. William Terry, general manager of the Sheffield Corporation Waterworks, before the British Waterworks Association. It was clearly shown by the author that the present complex system of valuation and rating is not adapted to modern conditions and is in urgent need of complete revision. Notwithstanding reports and recommendations made by Royal Commissions and Departmental Committees on local taxation during the last thirty-five years no legislation has followed as yet.

The author suggested that the executive committee of the association should be authorized to put themselves into communication with similar associations concerned with gas, electricity, tramways, light railways, sewage disposal works, docks, and other public utility undertakings in order to prepare a combined statement, for presentation to the Government, on this matter of vital importance. A very useful paper was that read before the British Waterworks Association by Mr. Howard Spears. Stores and their application to the accounts, pricing of stocks, books, and storekeepers' duties, were among the matters dealt with. To the engineers and managers of waterworks companies this paper will be very valuable.

Reservoir Construction

Mr. H. J. F. Gourley's paper upon the use of grout in cut-off trenches and concrete core-walls for earth embankments read before the Institution of Water Engineers deals with a very important subject, and will be extremely useful for reference owing to the instances quoted and the figures given showing the saving to be effected by the use of the method and to the clear description of the procedure of carrying out such work.

Mr. T. C. Greenfield at the same meeting described a reservoir constructed over coal workings—namely, the Blaen-y-Cwm reservoir—in which case concrete foundations for a dam-core were carried down to the Farewell rock underlying the coal. The excavation of trenches from 60 ft. to 70 ft. deep through old, rotten tunnels and workings, presented great difficulty, and the descriptions of the methods by which this work was carried out are of considerable interest. In some sections a concrete core-wall was carried up from the rock to the top of the dam and faced with puddle on the upstream side, elsewhere a puddle-core was carried down to the rock, junction between the rock and the puddle clay being made by a wall of concrete with a knife-edge top in the centre of the core resting on the rock and joining the puddle.

The new reservoirs of the Metropolitan Water Board in Kent situated at Shooter's Hill, Eltham, Bromley, Bickley, Farnborough, and Sevenoaks are noteworthy. In this case we have an example of reservoirs built to a standard design with slight modifications such as the site may require. The standard unit is a rectangle 11 ft. 6¾ in. by 17 ft. 6¾ in., and throughout the interior the columns are spaced to these dimensions. Future reservoirs will be constructed as rectangles of suitable multiples of this unit. It is to be observed that the old circulation principle has been abandoned. Formerly circulation was obtained by means of a series of circular walls in the older reservoirs now superseded. Reinforced concrete roofing is supported on plain concrete pillars.

Water Treatment

Some interest has been aroused by the experiments reported by Mr. H. W. Clarke, chief chemist, Massachusetts Department of Public Health, in a paper read before the New England Waterworks Association. It appears that at the Lawrence Experiment Station good results were obtained by loading the sand of a slow sand filter with ordinary coagulants and by operating the filter at a slightly increased rate; a very large percentage of the organic matter, especially colouring matter, being removed, and a very clear water free from any increase of carbonic acid being produced. It appears that the rate of filtration was as high as 5 million English gallons per acre per day. It is claimed that the corrosive properties of the water are not increased materially, and that neither aluminium sulphate or alumina are found therein. The coagulant is thus used over and over again, so that the primary cost of the coagulant is practically the final cost. Filters in operation have had to be scraped only once or twice during a period of five years' operation when treating the Merrimack River water, the cost being about 55 cents per million gallons as against 6 or 7 dollars per million gallons paid for coagulants with mechanical filters. On the other hand, the bacteriological results of this method are poor, and the water has to be sterilized, but as chlorine is in almost universal use with filter plants in America at the present time this fact is not of great importance.

Of papers read at the American Waterworks Association Convention, that on Chlorination of Water Prior to Filtration, by Mr. Norman J. Howard, and a second paper by the same author dealing with Modern Practice in the Removal of Tastes and Odors, are worthy of note. Experiments at Toronto show that if raw water is treated with chlorine before filtration better results are obtained and a considerable saving of expense is effected than when it is first treated with alum, and that a large quantity of water can thus be passed through the filters and the filtered water has greater bacterial purity. This result, which is not altogether in agreement with experience elsewhere, may have been due to special causes such as the water not containing material of the quantity and quality that would collect and hold the bacteria on the filter, so that even if coagulant were used a certain number would pass through the filter. It may be also that the alum tended to clog the filter and cause the flow of water through it to be less rapid. Mr. Howard seems to be of opinion that the filters removed the taste of the chlorine, which would be a further advantage. Mr. K. F. Kellerman at the same convention dealt with the treatment of water containing algae, giving a very valuable table showing the exact quantities of copper sulphate required in order to kill various organisms, so that by detecting the special organism causing trouble, and by referring to Mr. Kellerman's table it should be possible to come to a right conclusion as to the dose of copper sulphate required.

With regard to the removal of tastes and odors from water, Mr. Howard is of opinion that the iodoform taste is more difficult to overcome than the chlorinous taste, but it does not appear that in making the experiments at Toronto the method by which Sir Alexander Houston obtained complete success has yet been tried. Sir Alexander found that by giving water a superdose of chlorine the formation of an iodoform taste was prevented, while dechlorination with a solution of sulphuric oxide removed the chlorinous taste; this ensured a water free from both chlorinous and iodoform tastes and bacteriologically perfect.

Water Mains

With regard to water mains, there is every reason to believe that the cement-lined water pipes which are now being supplied by manufacturers in this country will prove to be the solution of the difficulties of corrosion and incrustation. Cement as an interior surface for water mains has received much consideration both in the case of the reinforced concrete pipe and of the cement-lined steel and cast-iron pipes. The centrifugal process has been successfully applied for cement coating, and although this process has been under consideration for some years past, it is only recently that the cement-lined pipes have been on the market. It apparently remains, however, with the Americans to instruct us with regard to what has been done in the past with cement-lined pipes, and to give us examples of work. Mr. J. E. Gibson recently published a report in the Engineering News-Record giving evidence that cement-lined pipes have been used extensively and satisfactorily in America during the last seventy years. It does not appear that this fact is generally known. Thousands of miles of pipes have, however, been laid in many different places under varying conditions, careful examination has been made, and all evidence is to the effect that the cement-coating is a lasting and efficient safeguard against incrustation and tuberculation.

Cement Joints

The use of cement joints with iron pipes appears to be increasing, and it is to be noted that the same type of joint, namely the caulked cement joint, is used with the Stanton Hume Pipe. They were used with good results as long ago as 1915 at Los Angeles; recently they have been used at Portland, Oregon, where, after making tests on a 1,000 ft. length of 8 in. pipe, the cement joints have been adopted almost exclusively, excepting where it was necessary to put the mains under pressure at once. The joints are made with medium setting cement mixed so dry that the impress of the hand will be left upon a small ball which will crumble when let fall from a height of 12 in. The pipes must be laid upon a firm foundation. It is customary to place a small piece of lead under the spigot of the pipe in the joint so as to hold it in proper position, and just sufficient yarn is caulked into the socket to keep the cement from entering the pipe. Sweating occurs at first, but this gradually takes up.

The Contract Record's

Weekly House Suggestion No. 58

This beautiful new residence was completed recently for Mr. C. E. Baker, on Centre St., Ottawa, facing the Government Driveway and waterfront. The size of the residence in the main portion is 32 x 52 ft.

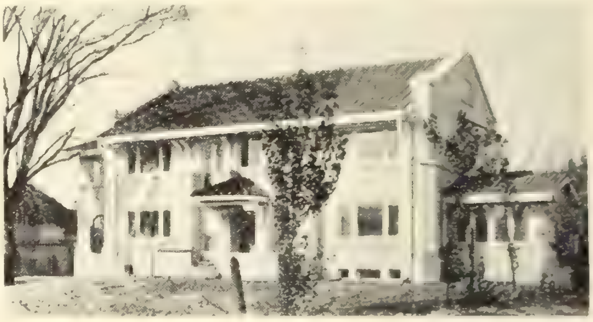
The ground floor consists of large reception hall, coat room, living room, dining room, kitchen and servery, sun room and verandah. The front entrance is a large open terrace.

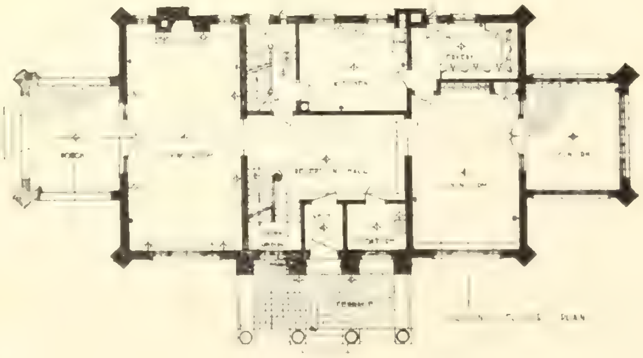
The first floor consists of four bedrooms, a den, two bathrooms and a sleeping porch.

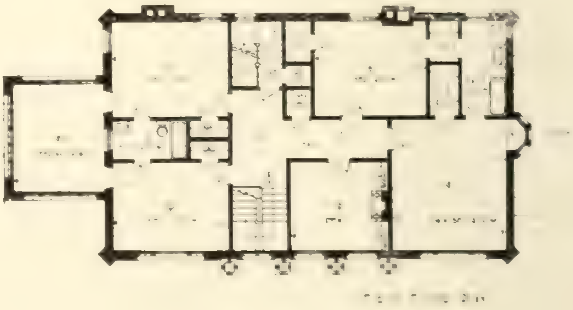
The finish throughout the ground floor is in hardwood, with the main stair in Colonial style. The construction of the residence is concrete throughout and outside facing is of fine crushed white Dolomite stone mixed with Meduza white cement. The roof is of tile furnished by the Ludowici-Celadon Tile Co. of Chicago.

The style of the building is Spanish of a Californian type.

The contractors for the bulk work were Alex. Christie and Son; plumbing and heating, W. G. Edge, Ltd.; plastering and outside stucco work, Murphy and Morrow; painting and glazing, Duford, Ltd.; electrical work Stanley Lewis. The architects were Messrs. Noffke, Morin & Sylvester, Central Chambers, Elgin St., Ottawa. The cost of the residence was approximately $[illegible]0,000.







Mainly Constructional

East and West—From Coast to Coast

The council of Carleton County, Ont., recently passed the report of the road and bridges committee which provided for an expenditure of $339,000 on county roads during the coming year.

The city council at Quebec have finally decided to adopt the design submitted by O. H. Cote, former Trade Commissioner of the Quebec Board of Trade, for the new Industrial Building which it is proposed to erect on the Exhibition Grounds. The design, however, will be slightly altered according to the suggestions of the housing architect, Mr. Ad. Trudel, and Mr. Edouard Hamel, assistant city engineer, one of the modifications being the curtailment of the length of the building from 396 to 378 ft.

A new association, known as The Contracting Plasterers' Association of London, Ont., has been organized at that city. The following are named as the first directors of the association: Messrs. John Fenn, Herbert Edward Parker, George Ambrose Slade, George Symons Gould and Francis Millman Dowell.

The tenth annual convention of the Canadian Good Roads Association will be held at the Royal Connaught Hotel, Hamilton, this year. The dates are June 11, 12, 13 and 14. The program has not been prepared as yet. All arrangements are in the hands of Mr. S. L. Squire, chairman of the executive and George A. McNamee, secretary of the association.

"The Future of The Engineering Profession" was the subject of an interesting address delivered by Mr. Fraser S. Keith, general secretary of the Engineering Institute of Canada, at a recent meeting of the Quebec Branch of the Engineering Institute, held at the Chateau Frontenac.

The bill introduced by Hon. Ernest Lapointe, Minister of Marine, providing for advancing to the Vancouver Board of Harbor Commissioners "such sums of money, not exceeding in all the sum of $5,000,000," for the carrying on of terminal construction work at Vancouver, was the first to be passed by the House this season.

The Quebec Liquor Commission is to have a new building, which will include a warehouse and accommodation for the offices of the commission. It will cost $500,000.

At a special meeting of the Town Council of Weston, Ont., recently, the additional $35,000 asked for by the Board of Education was granted, making the grant for the new vocational addition to the high school a total of $150,000. The new extension will contain about 16 rooms. Work will be commenced as soon as possible.

The application of the Ontario Department of Public Highways for the construction of a subway sixty feet in clear width, with a head clearance of sixteen feet on a new road in the Oakridge district, Toronto, proposed as an extension of Danforth Avenue, about one mile east of the city limits, was approved in principle by the Dominion Railway Commissioners at a recent session of the Board in the City Hall.

The city of Montreal will offer no objection to the construction of the proposed power dam on Back River, it is stated, providing it is guaranteed that the city be reimbursed for any expense incurred by reason of the altering of the present sewer system, the construction of new sewers and for any possible damage resulting from this work. This dam will follow the shore line as far as Sault-au-Recollet church, and thence curve across to the head of Visitation Island, thence along the north shore of Visitation Island, and extending down the river to a distance of about 1,000 feet, where it turns at a right angle towards the north shore of the river. The total length of the dam will be about 11,000 feet. The power house will be situated on the north shore, where, it is said, about 45,000 horse-power will be developed.

The widening of Sherbrooke St. Montreal, within the city limits, to a width of 125 ft., as proposed recently, would cost $35,000,000, it is estimated. Although there is nothing to indicate an actual start being made on this development, the issue is still a live one, as the Law Department has received instruction from the Executive Committee of the City Council to homolgate the line on the north side of the thoroughfare to the depth indicated.

The contract for the Montreal Court House Annex was awarded recently. The total sum involved amounts to $2,182,447, exclusive of the cost of the steelwork already up, and is divided in the following manner: The contract for the general construction work in stone and granite was awarded jointly to Alphonse Gratton and the Atlas Construction Company, at a cost of $1,943,560. The contract for the plumbing was awarded to James Ballantyne, of Montreal, for $216,987. The electrical contract was awarded to the Canadian Comstock Company for $21,900. Work upon the contracts, which will be commenced immediately, will occupy a period of from eighteen months to two years, it is estimated. The total cost of the entire building will be over $3,000,000.

All the provinces, with the exception of Manitoba and Prince Edward Island, are receiving larger grants for public works this year than last year. The total sum involved in the Dominion subsidies this year is $12,289,618.88, an increase of $718,758.40 over last year's grants. Manitoba will get $1,468,685.76 this year, as against $1,470,991.36 last year. The amounts payable to each province with respective increases follow: Ontario, $2,642,611.68, increase, 246,232.80. Quebec, $2,256,419.88, increase $286,789.000. Nova Scotia $661,866.06, increase $25,199.20. New Brunswick, $666,765.76, increase $28,789.60. British Columbia, $738,816.66, increase $115,681.60. Prince Edward Island, $381,931.88, unchanged. Alberta, $1,628,638.20, increase $7,563.20. Saskatchewan, $1,763,883.00, increase $10,808.00.

Fire caused damage estimated at $10,000 when it completely destroyed the barns of the Ottawa Brick Manufacturing Company, on the Prescott highway near Ottawa, a few days ago.

A recent notice in the Ontario Gazette states that the Provincial Stone & Supply Co. Ltd., of Toronto, has been dissolved.

Personal

Mr. J. D. Craig, B.A., B.Sc., gave an illustrated address on the Arctic Archipelago, before a recent meeting of the Ottawa Branch of the Engineering Institute of Canada. Five thousand feet of film, taken during the 1922 government expedition, was shown.

City Engineer E. R. Gray, of Hamilton, has resigned to take over the position of Manager of Parks. Mr. Gray, on tendering his resignation, stated that for some time past he had felt the great nervous strain of the ever-increasing responsibilities of his position and, in justice to himself, decided on this change. In addition to the duties of his new position, Mr. Gray will be allowed to do private consulting work.

CONSTRUCTIONAL ACTIVITY

Period of Feb. 21 to Feb. 27, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Alvinston, Ont.
Extensions to the watermains contemplated by the Town Council. Mr. Rillett, Reeve.

Beamsville, Ont.
Town Council plans to commence work immediately on the laying of 6" watermains. W. C. Fairbrother, clerk, will buy material.

Brantford, Ont.
Tenders for road materials including cement, asphalt, sewer pipe, road oil, etc. will be received by City Council until Mar. 8. Frank Adams, engineer.

Collin's Bay, Ont.
Victor Osterberg Construction Co. Ltd., Halifax, have the general contract for a road diversion for Kingston Roads Commission. R. H. Fair, 179 Stuart St., Kingston, superintendent.

Fredericton, N. B.
Concrete sidewalks contemplated by the City Council. C. S. R. Pennins, clerk.

Marbelton, Que.
Town contemplates a road. I. E. Vallee, Parliament Buildings, Quebec, engineer.

Middlesex Co., Ont.
Included in the road improvements contemplated by the County Council is a 27' concrete pavement costing $60,000.

Morton, Ont.
Tenders for quarrying and cutting street paving blocks are being received by J. C. Judd. Large contract will be awarded to contractor having adequate facilities who can begin operations at once.

Province of Ontario.
Provincial Department of Highways, University & Dundas Sts., Toronto, want tenders on roadwork as advertised in this issue of the Contract Record.

Riverside, Ont.
R. W. Code, McGregor Bldg., Windsor, engineer for the Town Council which contemplates thirty miles of new streets this spring.

About Mar. 15 tenders will be called by the Town Council for a sewage disposal plant and trunk line sewers costing $150,000. R. W. Code, McGregor Bldg., Windsor, engineer. C. J. McHugh, Ford, Ont., clerk.

St. Michel de Napierville, Que.
The Town Council contemplates a macadam road costing $15,000. Hilaire Lemire, mayor.

Railroads, Bridges and Wharves

Brantford, Ont.
Plans are almost completed for the $335,000 bridge across the Grand River and tenders on re-inforcing rods will be called for in March. H. F. Leonard, clerk.

Humber Bay, Ont.
Hydro Electric Power Commission, 190 University Ave., Toronto, contemplates double tracking the radial line between Humber Bay and Port Credit and making terminal improvements. Cost will be about $150,000. F. A. Gaby, Chief Engineer.

Lambton County, Ont.
Bulk and separate tenders are being received by J. A. Huey, County Clerk, for a bridge, until Mar. 14. John McCallum, Alvinston, Road Superintendent.

Niagara Falls, Ont.
Tenders will be called about the end of April for foundations for a bridge between Niagara Falls, Ont., and Niagara Falls, N. Y. for the Michigan Central R. R. B. A. Aikens, 302 Michigan Central Depot Bldg., Purcasing Agent.

Ottawa, Ont.
Ottawa Improvement Commission, Castle Bldg., have had plans drawn for three bridges which it is expected will be built this year. Alex. Stuart, engineer.

Wotton, Que.
Tenders will be received until Mar. 5 by T. Gervais, secretary, for a bridge of concrete and iron construction.

CONTRACTS AWARDED

Sackville, N. B.
The Provincial Government has awarded J. W. Steeves, Petitcodiac, N. B., the general contract for a bridge costing $7,000.

Waterford, N. B.
Contract for a bridge has been awarded by the Provincial Government to Judson A. Cleveland, Alma, Albert County.

Public Buildings, Churches and Schools

Brantford, Ont.
A. C. Lyons, 26 Dufferin St., is interested in the formation of a company to build a community garage costing $100,000. Work on this project may commence in the spring.

Tenders will be called by A. K. Bunnell, secretary-treasurer of the Board of Governors, for a $50,000 addition to the hospital. Wm. Tilley, Temple Bldg., architect.

Hamilton, Ont.
Whitton & Walsh, 7 Hughson St., are preparing plans for an addition to the general hospital.

Two Police Stations are contemplated by the City Council. Mayor Coppley and Magistrate Jelfs, interested.

Langley Prairie, B. C.
The first unit of the High School, costing $6,600 contemplated. Dr. A McBurney, chairman of the Board Benzie & Bow, Standard Bank Bldg architects.

London, Ont.
Work will start at once on the $25,000 addition to the St. James Episcopal Sunday School. The general contractors are Hyatt Bros., 290 Egerton Ave. Rector. Rev. L. Armitage.

Midland, Ont.
Tenders for the $30,000 addition to the High School will be received by C. A Wilson, secretary, until Mar. 15. Wilfrid Smith, 295 Fifth Ave., architect.

Mitchell, Ont.
High School Board, Dr. Armstrong, chairman, plans to select an architect and proceed with the building of a $60,000 building as soon as possible. A. D. Cameron, secretary.

Niagara Falls, Ont.
Board has approved plans for addition to a school costing $80,000 and bulk and separate tenders will be called shortly. W. S. Byers, 131 Victoria Ave., secretary.

Ottawa, Ont.
Bulk tenders will be received until Mar. 7 for lathing and plastering the main building of the hospital. Tenders being received by the Hospital Commission. N. H. H. Lett, clerk.

Point Grey, B. C.
The Provincial Government and the University of British Columbia are preparing plans for temporary University Buildings. Several structures of frame and stucco planned. Tenders will be called for early in March. Henry Whittaker, Parliament Buildings, Victoria, architect.

Richmond Hill, Ont.
Burden & Gouinlock, 101 King St. W., Toronto, have been appointed the architects for the High School.

St. John's Que.
Extensive alterations are contemplated by the congregation of St. John the Evangelist Parish to their church. Father Coursol is the parish priest. Architect not yet appointed.

Saltfleet Twp., Ont.
St. Joseph's Convent, Hamilton, contemplate an orphanage on the 40 acre lot presented to the Convent by Bishop

Dowling. Rev. J. A. O'Sullivan; chancellor.

Stratford, Ont.
Y.M.C.A. Building contemplated. Mrs. G. R. Deacon, 101 Brunswick Ave., interested.

Tillsonburg, Ont.
Tenders are expected to be called in March for the $1,000 addition to the Tillsonburg Arena. F. R. Flood, sec.-treas.

Toronto, Ont.
New tenders will be called shortly for an edifice for St. John's Anglican Church. Gordon & Helliwell, Confederation Life Bldg., architects.

The St. Mathew's Lawn Bowling Club, Gerrard St. E., propose to erect an $8,000 Club House. E. G. Wilson, architect, 42 Langley Ave., is receiving bulk and separate tenders.

New edifice contemplated by Christ Church. Rt. Rev. Willard Brewing, 491 Euclid Ave., bishop. Architect not yet appointed.

York Twp., Ont.
D. R. Franklin, 587½ Yonge St., is preparing plans for a school in York Twp. Andrew Duncan. 112 Hillary Ave., Silverthorne, secretary.

CONTRACTS AWARDED

Bronte, Ont.
Smith & Wright, 2945 Dundas St., Toronto, have been appointed architects for the $40,000 school at Bronte. A. O. Flumerfelt, secretary-treasurer.

Gosfield South Twp., Ont.
The general contract for a school costing $10,000 has been awarded by the trustees of S.S. No. 10 to Mr. Corlett, Laemington.

Montreal, Que.
The general contract for Montreal's $3 000,000 Police Courts has been awarded jointly between Alphonse Gratton & Atlas Construction Co. Ltd., at $1,933,560. Electric and installation contract let to Canadian Comstock Co. Ltd., at $21,000 while the plumbing contract was awarded to Jas. Ballentyne, 163 Nazareth St., at $260,987.

Terazzo and tile contract for a church and sancristy costing $210,000 has been awarded to Pizzagalli's Terazzo Tile Mfg. Co., 61 Bailey St. J. H. Caron, 718 Delorime St., architect.

St. Catharines, Ont.
S.S. No. 2 Grantham and No. 8 Louth have awarded J. R. Davies, 31 Pleasant Ave., the general contract for additions to the schools. J. Thompson, R.R. No. 3 St. Catharines, secretary.

Tetreaultville, Que.
T. Gauthier, 4 Mercier St., Montreal, has the general contract for a Presbytery and Chapel for the congregation of St. Bernard Parish costing $55,000.

Weston, Ont.
Norman McLeod Ltd., Kent Bldg, Toronto, has been awarded the general contract for the Industrial and Vocational School which will cost about $125,000. S. B. Coon & Son, 4 St. Thomas St., Toronto, architects.

Business Buildings and Industrial Plants

Brantford, Ont.
Brantford Cordage Co., West Brantford, plan an addition to their factory at a cost of $30,000. C. Messar, manager.

Cloverdale, B. C.
William Lawrence contemplates the erection of a garage and service station at a cost of $7,000. Architect and general contractor, D. S. Barton, Cloverdale.

Coquitlam, B. C.
Stock sheds and dry kilns owned by the Rainbow Shingle Co., and valued at $25,000, were destroyed by fire. Company plans to re-build in brick and tile. T. W. Greer, acting-manager.

East Gore, N. S.
Gore Coal Mining Co. Ltd., Shubenacadie, N. S. contemplate a coal mining bank head and shaft costing $25,000. Henry Ollerhead, Cabot St., Sydney N. S., superintendent.

Glace Bay, N. S.
Motion Picture Theatre and stores owned by Nolan & Farrell damaged by fire to the extent of $30,000.

Hamilton, Ont.
A million dollar fireproof building will be built at once to replace the Lister Building destroyed by fire at a loss of $500,000. J. E. Lister, 133 Glenfern Ave., owner.

J. E. Lister, Lister Building, contemplates a store arcade, but work will not proceed for several months.

Tenders on 3 stores will be received by G. T. Evans, Clyde Block, until Mar. 7.

R. A. Foley, resident engineer, c/o United Gas & Fuel Co., 13 Main St. E., will receive tenders until Mar. 15 for the $2,500,000 plant proposed by Hamilton By-products Coke Oven Co. Ltd.

Lansing, Ont.
Sterling Bank will erect a new building to replace the one recently destroyed by fire.

Montreal, Que.
Granger Freres 43 Notre Dame St. W., will call for tenders shortly on a one storey addition to a building at a cost of $10,000.

Plans are almost completed and tenders will be called for immediately on a $50 000 loft building. Chas. Dufort, 195 St. Catherine St., architect.

Sherwin-Williams Co. Ltd., 897 Centre St., will shortly commence work on a $6,000 warehouse. J. S. Bowden, engineer.

Plans for a $150,000 warehouse for Drummond McColl & Co. Ltd., 28 Victoria Sq., are almost completed. Fred. G. Ross, architect. Tenders will be called about Mar. 15.

In April tenders are expected to be called for an office building for Credit Canada Ltd., 145 St. James St. U. J. Asselin, 332 Bleury St., architect. E. A. Ouimet, manager.

Ottawa, Ont.
Stores are contemplated by A. McMillen, 82 Sparks St. N. D. Porter, Bank and Albert Sts., agent.

Padoue, Que.
Emile Gagnon will erect a barn costing $8,000.

St. Alex Des Monts, Que.
Store and blacksmith shop owned by A. Lemay destroyed by fire at a loss of $12,000 will be re-built in the spring.

St. John's, Que.
$20,000 garage contemplated by A. E. Gregoire, automobile dealer. Work to commence early in May. Architect not yet appointed.

Sorel, Que.
Tenders will probably be called shortly for an hotel. Arthur Desmaris, manager of the Balmoral Hotel, interested.

Stratford, Ont.
M. Gray, Ontario St., is having plans prepared for a garage. T. J. Hepburn, Downie St., architect.

Toronto, Ont.
A store and apartment costing $7,000 contemplated by Mary Reilly, 80 Grant St. Bulk and separate tenders on all trades are being received

Bulk and separate tenders on three stores and twelve apartments will be called shortly by W. G. Hunt, Confederation Life Bldg., who prepared the plans for A. Poyntz, 790 St. Clair Ave.

Moore Bros., 23 Weyland Ave., are receiving tenders for roofing, plumbing, electrical, heating and painting contracts for a factory.

Plans for alterations to a factory building to the extent of $15,000 are being prepared by Kaplan & Sprachman, 298 Dundas St. W.

Tenders are wanted, Kaplan & Sprachman, 298 Dundas St. W., architects, for store and apartment costing $7,000. Tenders will be received until Mar. 8.

Vancouver, B. C.
Dominion Construction Co., 509 Granville St., will commence work shortly on a store and printing plant for E. A. Cleveland, Department of Lands, Parliament Buildings, Victoria. T. A. Fee, 570 Granville St., Vancouver, architect.

L. M. Deither Coal Co. is having a $10,000 coal and supply bunker erected by Hodgson, King & Marble, London Bldg. Louis Deither, manager.

A. E. Betchley, 800 Robinson St., will commence work shortly on 5 stores costing $9,500.

Windsor, Ont.
Moore Bros., 486 Janette St., general contractors, are excavating for two stores for Wm. Down, 705 Howard Ave.

CONTRACTS AWARDED

Hamilton, Ont.
MacKay Bros., St. Eloi Apts., have been awarded the general contract by L Rosenblood for a store and apartment to cost $15,000.

Stuart & Sinclair, 17 Jackson St. E., general contractors, will build a $28,000 addition to Hamilton Cotton Mills factory. Allan Young, 304 Mary St., general manager.

London, Ont.
The general contract for storage buildings costing $10,000 have been awarded

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

Tenders Wanted

Sealed tenders, marked Tender, and addressed to the undersigned, or to John A. Huey, County Clerk, Sarnia, will be received up till 12 o'clock noon of **Wednesday, March 14th, 1923,** for the furnishing of all material, erection and completion of a 150′ centre to centre bearings,

18 ft. Roadway Bridge

known as Bridgen Bridge over Bear Creek on 6-7 S,R, Con. 5, Moore Township, Lambton County.

Tenders may be for the abutments and floor, for the Steel work, or for the entire work of the Bridge.

Plans and specifications may be examined at the office of George A. McCubbin, County Engineer, Chatham; or John A. Huey, County Clerk, Sarnia; or John McCallum, County Road Supt., Alvinston, Ontario.

All tenders must be accompanied by a marked cheque for 5% of the amount of tender and the name of an approved Guarantee Company.

Lowest or any tender not necessarily accepted.

Dated at Alvinston, this 12th day of February, 1923.

JOHN McCALLUM,
8-10 County Road Superintendent.

DEPARTMENT OF ROADS

TENDERS

Lovis-St. Lambert Highway, Parish of Ste. Angele-de-Laval

Tenders made on forms supplied by the Department of Roads and placed under envelopes bearing the words: "Tender—Levis-St.-Lambert Highway, parish of Ste. Angele-de-Laval," shall be received at the office of the Minister of Roads in the city of Quebec, Government Building, up to one o'clock of the afternoon, on

Wednesday the Seventh (7) of March, 1923

for the oil macadam of the Levis-St.-Lambert Highway in the municipality of Ste. Angele-de-Laval, in the county of Nicolet, Length 30,406 feet.

The Government of the Province of Quebec does not bind itself to accept any of the tenders.

Quebec, February 13th, 1923.

J. L. BOULANGER,
8-9 Deputy Minister.

OPEN FOR POSITION as foreman or superintendent, 20 years experience concrete bridge and culvert, pile driving, coffer dam work. References if necessary. Will go anywhere. Box 495, Burlington, Ont. 7-9

RATES

20 cents per agate line (14 lines to the inch) Positions Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

ONTARIO

Notice to Contractors

Separate sealed tenders marked "Tender for Contract No. ......" will be received by the undersigned until 12 o'clock noon on

Wednesday, March 21st, 1923

for the following work on the Provincial Highways:

Concrete Pavement

Contract No. 894—Crumlin Easterly 2.75 miles.
" " 895—Essex to Maidstone 4.00 miles.
" " 896—Preston to Freeport 2.4 miles.
" " 938—St. Thomas Easterly 2.0 miles.

Asphaltic Concrete Pavement

Contract No. 898—Hamilton Southerly 4.0 miles.

Macadam Roadway

Contract No. 899—Odessa Easterly 3.1 miles.

Macadam Base Course

Contract No. 900—West limits Yonge Township easterly 3.9 miles.
" " 901—Beckett's Bridge to Chambers Corners 2.3 miles.
" " 904—Ashton to Carleton Place 5.1 miles, including grading.
" " 920—From 3 miles west of Cornwall westerly 3.8 miles.

Grading

Contract No. 902—Hawkesbury West 1.8 miles.
" " 903—Richardson Sideroad to Townline, 4.1 miles.
" " 905—From 3.3 miles south of Elgin southerly 4.0 miles.
" " 906—Kenilworth North 4.0 miles.
" " 907—Cedar Springs West 4.0 miles.
" " 909—From 3 miles North of St. Johns, Northerly 1.0 miles.
" " 910—Arkona South to Sarnia, gravel road 4.8 miles.
" " 911—Clinton to Seaforth 4.0 miles.
" " 912—From 2 miles West of Clifford Westerly 2.5 miles.
" " 913—Tillsonburg Easterly 4.9 miles
" " 879—Tooley's Hill.
" " 943—Stittsville to Stanley's Corners 2.0 miles.
" " 944—[illegible]
" " 945—Durham South 7.0 miles.
" " 946—Orford 4.0 miles.
" " 947—Ekfrid 5.0 miles.
" " 949—From 3 miles West of Parkhill westerly 1.4 miles.
" " 950—Clinton West 3.2 miles.
" " 952—[illegible] easterly on Forks Road, 3.0 miles.
" " 953—9th to 11th Con. 1.8 miles.
" " 841—Sarnia Gravel Road from [illegible] miles.

Bridge Abutments

Contract No. 954—Extension to two steel bridges on Stratford-Goderich Road.
" " 955—Two Walkerton Bridges and Mildmay Bridge.
" " 957—McKenzie Creek on Caledonia Road.
" " 958—Boston Creek on Caledonia Rd
" " 959—Bloomfield Bridge.
" " 962—Elginfield Bridge.

Concrete Culverts

Contract No. 937—King and Whitchurch Townships.

Plans, Specifications, information to bidders, tender forms, and tender envelopes may be obtained on and after Wednesday, February 28th, 1923, at the office of the undersigned, or from the following Resident Engineers:

A. H. Parker, Cornwall; A. L. Baldwin, Brockville; C. K. S. Macdonell, Woodstock; W. M. Webb, Kingsville; H. C. Rose, Guelph; C. H. Nelson, Whitby; R. MacLennan, Simcoe; J. G. Smith, St. Thomas; W. F. Noonan, Napanee; D. H. Philp, Toronto; H. Smail, Kingston; R. S. Smith, Renfrew; C. A. Robbins, Durham; J. M. Empey, St. Mary's; J. A. Tom, Stratford; G. A. Downey, Walkerton; F. Brinkman, L'Orignal; R. MacLennan, Cayuga; A. Earchman, Carleton Place; J. Sears, Chatham.

A marked cheque for $1,000.00 payable to the Minister of Public Works and Highways, Ontario, or a Guaranty Company's bid bond for a similar amount must be attached to tenders for pavements, roadways, base course and bridge construction, and on all other tenders the above conditions apply, but the amount of bond or cheque required is $500.00. A Guaranty Company's Contract Bond for 50 per cent. of the amount of the tender will be furnished by contractor when contract is signed. All bonds must be made out on Departmental forms.

The lowest or any tender not necessarily accepted.

W. A. McLEAN,
Deputy Minister of Highways.

Department of Public Highways, Ontario
Toronto, February 21st, 1923. 9

To Contractors and Others

There will be sold by Public Auction at the Town Hall, Cayuga, Ont., on the 3rd day of March, 1923, at two p.m. a valuable

Road-stone Quarry and Crushing Plant

on the Talbot Road, about four miles from Cayuga in the County of Haldimand.

For particulars and conditions of sale apply to Ludwig & Ballantyne, Continental Life Building, Toronto. Harrison Arrell, K.C., Caledonia, Ont., R. S. Colter, Barrister, etc., Cayuga. 8-10

CONTRACTORS

Sealed bulk and separate tenders, addressed to C. A. Wilson, Secretary-Treasurer of the Board of Education, Midland, endorsed with the word "Tender" will be received until

March 15th, 1923

for all trades in the Alteration and Erection of an Addition to the Midland High School. Tenders must be in the hands of the Secretary-Treasurer not later than 6 o'clock P.M. on the day named, after which no tender will be received.

The lowest or any tender will not necessarily be accepted.

Plans and Specifications upon receipt of a marked cheque for $25.00 may be had at the Architect's office, Mr. W. F. Smith, Midland, and upon return of plans and specifications cheque will be returned. Each tender is to be accompanied by a marked cheque for 5% of total tender, returnable to unsuccessful tenderers. 9

CITY OF KINGSTON

Tenders for Asphalt Cement, Road Oil, Castings and Sewer Pipe

Sealed Tenders will be received by the undersigned until 3 o'clock P.M.

Wednesday, March 7th, 1923

for the supply of Asphalt Cement, Road Oil, Castings and Sewer Pipe required by the City of Kingston during 1923.

Specifications and form of tender may be obtained on application to the City Engineer. Each tender shall be accompanied by a marked cheque as per specification.

The lowest or any tender not necessarily accepted.

H. S. DICK,
City Engineer.
Kingston, Ont. Feb. 23rd., 1923. 9

Sealed Tenders for Concrete Roadway for the County of Waterloo

For approximately 3,600 sq. yds. 7" concrete 18' wide West of the Village of Wellesley, Provl. County Road No. 109.

For approximately 2,000 sq. yds. 8" concrete pavement 20' wide South of the Village of Wellesley, Provl. County Road No. 109.

For approximately 18,773 sq. yds. 7" concrete pavement 16' wide between Heidelberg and St. Clements, Villages, Provl. County Road No. 109.

For a 14 foot span reinforced concrete slab bridge near German Mills, County Road No. 12.

Specifications and form of tender can be seen at the County Clerk's Office, Court House, Kitchener, Ont.

For all information apply to L. S. Lichty, County Road Superintendent, Wellesley, Ont.

All tenders to be by the square yard. Tenders will be received up until 12 o'clock noon.

Thursday, March 15th, 1923

The lowest or any tender not necessarily accepted.

All tenders to be addressed to Samuel Cassel, County Clerk, Court House, Kitchener, Ont., and marked cheque of five per cent of contract price to accompany each tender.

9-10

Town of St. Andrews, N. B.

Tenders will be received by the Chairman of the Sewer Committee St. Andrews, N.B. up to **March 12th, 1923**, on the following material:

1,500 feet of 6", 8,000 feet of 8", 1,600 feet of 10", 1,000 feet of 12", 1,500 feet of 15" and 600 feet of 20" vitrified clay pipe, 10" to 4 and 8" to 4", Y junction. 36 man hole frames and covers.

Specifications may be obtained upon application to Mackenzie & Armstrong Engineers, Woodstock, New Brunswick.

Plans, profiles and specifications covering labor contract may be seen at the office of the Town Treasurer, St. Andrews or at the office of R. F. Armstrong, Woodstock.

9

Extension of Time

for the receiving of tenders for all trades required in the erection of addition to school building at Waterloo, Ontario, will be received by Edward Dehler Esq., Secretary, separate School Board, Waterloo, Ontario until

Monday, March 12th at 5 P.M.

J. M. COWAN, Architect
991 Bay Street,
9 Toronto.

Wanted—Dump Wagons

Good condition, reasonable price. Shenton, 29 Annette Street, Toronto. 9

STEEL PILING

1000 tons 40' long.
14" x 3/8" Arch Web.
7" x 1/4" Straight Web.
All ready to load.
UNIVERSAL EQUIPMENT COMPANY,
1 T.f. Niagara Falls, Ont.

WANTED

Rent or buy—one small Dredge, on a small job. Suitable for dredging a small creek half yard dipper or smaller required. Reply to Bryson & Irwin, Wiarton, Ontario, Contractors 8-11

FOR SALE

Byers No. 3 Auto Crane, road wheels; 38 ft. boom; ½ yard Clam—capacity 350 yards per day, located Windsor. Specifications and terms apply Cadwell Sand & Gravel Co. Ltd., Windsor, Ont. 7-10

FOR SALE

Keystone Excavating Machine, complete with two sticks, skimmer scoop, and three ditching scoops; this machine has been used only one season and is guaranteed to be in first class condition. Price $4,500 f.o.b. St. John, N. B.

Austin Backfiller with caterpillar traction, 4-cylinder Buffalo engine, in equally good condition. Price $2,500 f.o.b. St. John, N. B. Canada Lock Joint Pipe Limited, 65 Pleasant Boulevard, Toronto, Ont.; or St. John, N. B. 6-T.f.

CONSTRUCTION SUPERINTENDENT with 15 years experience handling all classes of building and water work, wants position. A1 testimonial and guarantee results. Will go anywhere Box 147, Contract Record, Toronto. 8-10

Plant for Sale

The County of Lincoln offer the following road machinery for sale.

2 Road Rollers, 2 Gas Tractors, 1 Scarifier, 1 Climax Oil distributor, 4—3 yd. reversible dump trailers, 2—10 H.P. Vertical Boilers, 2—Oil Tanks with heating appliances, 1 Four Wheel Drive Truck, 1 Steam Tractor, 1—10" x 20" jaw crusher with equipment, 1 Derrick and Hoist complete.

Details of the above plant may be obtained and arrangements made for inspection on application to the undersigned.

F. N. RUTHERFORD,
County Engineer,
9-10 St. Catharines, Ont.

FOR SALE

1	60 H.P. Waterous Locomotive Type Boiler.
1	40 H.P. Vertical Engine.
1	30 H.P. Vertical Engine.
1	25 H.P. Vertical Engine.
2	3" - 2" Steam Pumps.
1	60' c to c belt elevator 26" belt 24" buckets.
1	24" x 24" Friction Hoist.
23	2 cu. yd. 4' gauge Quarry Cars.
1	150 H.P. Erie City Steam Engine.
1	48" Revolving Screen.
1	Traction Engine.
1	Feed Water Heater.
	Several 6" Steam Gate Valves.
2	Locomotive Air Pumps.

All above machinery can be seen at our plant, Hagersville, Ontario.

8-11 Hagersville Quarries, Limited.

FOR SALE

Electric Travelling Cranes and Steel Crane Runways

STEEL CRANE RUNWAY—382 ft. long; height of columns 30 ft.; weight about 150 tons. Used for 15-ton Crane 80 ft. span.

1—CLEVELAND ELECTRIC TRAVELLING CRANE 80 ft. span; capacity 15 tons. At present in service on the above Runway.

STEEL CRANE RUNWAY—220 ft. long; height of columns 23 ft. Also 22 additional Girders each 20 ft., without columns, sufficient to extend Runway 220 feet additional. Total weight about 50 tons. Used for 7½-ton Crane 70 ft. span.

2—CLEVELAND ELECTRIC TRAVELLING CRANES—37 ft. span; one-15-ton capacity, and one 10-ton capacity, without Electrical Equipment.

Ask for prices and further particulars, also a complete list of our second hand machinery.

The Maritime Bridge Co., Limited
New Glasgow, Nova Scotia
6 T.f

Some One Wants to Buy

The equipment or machinery that you are not using.

It may be occupying valuable space in your yard or shop, collecting dust, rust and hard knocks.

Sell it before "Depreciation" scraps it.

Use the Tender & For Sale Department. It helps others, let it help you.

WANTED—First class architectural draughtsman at once. State experience and salary. Watt & Blackwell, Architects, London, Ontario. 9

QUANTITY SURVEYOR Fully qualified in all branches of the profession open for engagement. Apply Box 120, Contract Record, Toronto. 6-9

Tenders Wanted

[illegible] High School has been

extended until Monday, March 5th, 1923

Tenders must be in the hands of T. F. Thompson, Secretary Board of Education, not later than 7 p.m. on date named, after which no tender will be received.

Lowest or any tender not necessarily accepted.

Plans and specifications may be seen and all information obtained at the office of the architect, D. R. Franklin, 587½ Yonge Street, Toronto.
Dr. F. E. MELLOW, Chairman of Committee.
9

Tenders Wanted

BOARD OF EDUCATION

Sealed tenders, addressed to the Business Administrator and Secretary-Treasurer, Board of Education, Administration Building, 155 College St., endorsed with the word "Tender" and also with the name of the school building and trade or article to which it relates, will be received until

Tuesday, March 6th, 1923

for

(1) Plastering, Terrazzo Flooring, Ash Hoist, Hardware for KITCHENER SCHOOL.
(2) Painting and Glazing, Asphalt Mastic, Ventilation, Local Phones, Hardware for GLEDHILL SCHOOL.
(3) Plumbing, Heating and Ventilating, Heat Regulation, Electric Wiring, Local Phones, Clock and Signal System for JARVIS COLLEGIATE.
(4) Roofing and Tinsmithing for HUMBERSIDE COLLEGIATE.
(5) Electric Wiring for ADMINISTRATION BUILDING.

Specifications and conditions of tendering may be seen and all information obtained at the office of the Architect of the Board, 155 College St., Telephone Trinity 8200.

Tenders must be in the office of the Secretarial Department at the Administration Building, 155 College St., not later than 4 P.M. on the day named, after which no tender will be received. The lowest or any tender will not necessarily be accepted.

F. E. POWELL,
Chairman of Property Committee.
W. W. PEARSE,
Business Administrator and Secretary-Treasurer.
9

GENERAL CONSTRUCTION SUPERINTENDENT, expert in reinforced concrete buildings, bridges, etc., open for position. Box 140, Contract Record, Toronto. 7-9

WANTED—Position as draftsman for sewer design. One year sewer experience and six years at mechanical drafting. Ernest Jarrold, 139 Avondale Ave., Hamilton, Ont. 8-9

Building Activity in Shanghi

There is a great deal of building activity going on in Shanghi, and with the completion of a modern sewerage and drainage system in the very near future, there should be a large demand for modern sanitary equipment.

[illegible] Motor Co. Ltd., [illegible] Creighton Woodwork Co., 701 Central Ave.

Montreal, Que.

Vezina & Dugal, 1244 Dorion St., are building a $6,000 factory for P. Routier, 705 Mount Royal Ave.

Contracts on a building containing stores, offices, dwellings and a gasoline station have been let by O. Roberts, owner and builder, 340 Hingston Ave., as follows: Steel, Pheonix Bridge & Iron Works Ltd., Colborne St.; roofing, D. Nicholson & Co., St. Paul St.; plastering, J. Leger, Ville St. Pierre.

Ottawa, Ont.

Rolla Crain Printing Co., Spruce St., has awarded the general contract for an addition to their printing plant to C. I. Stata, 209 Pretoria St.

Quebec, Que.

Magloire Couchon, 307 Richardson St., has been awarded the general contract for the alterations to a warehouse for a store and office building. Cost will be about $40,000.

Stratford, Ont.

Player Bros., Player St., have the general contract for an addition to Stratford Mfg. Co's. factory. The carpentry work will be handled by F. Ingram, Birmingham St.

Sydney, N. S.

Contracts for re-building stores and offices at $25,000, for A. Wolfson, Park St., awarded as follows: Plumbing & heating, Hagen & Co., 452 George St.; plastering, M. Isreal, 120 Union St.; electrical, McKay Electric Co., 219 Charlotte St.

Three Rivers, Que.

A. Heon & Cie, 45 St. Antoine St., have been awarded the general contract for a store by Louis Badeau, Des Forges.

Toronto, Ont.

The general contract for an $8,000 storage building for Toronto Hardware Co., 402 Dufferin St., has been awarded to W. A. Henry, 35 Albertus Ave., Toronto.

C. Gray & Sons, 207 Sackville St., have the contract for heating and plumbing for the $40,000 factory being erected by Oliver Spanner & Co., 26 Elm St.

Contracts for excavation and foundations for an exchange building for the Bell Telephone Co. have been awarded to Jackson-Lewis Co. Ltd., Ryrie Bldg. Dominion Bridge Co. Ltd., has the contract for structural steel.

Geo. W. Reed Co. Ltd., H. A. J. Aldington, Yonge St. Arcade, agents, have the roofing and sheet metal contracts for the Ford assembly plant.

Windsor, Ont.

Geo. Cormie, 900 Windsor Ave., has the plastering contract for a $32,500 business block built by the Windsor Construction Co., 14 Victoria Rd., for C. S. King, Gas Bldg., Chatham.

Plumbing contract on stores and flats being built by Peter Osterhout has been awarded to Herb. Pragnell, London St. W. Plastering contract let to A. Pickering, Hall Ave.

Jas. Mausel Co., Bruce St., has the contract for asphalt for the addition to the British American Brewery.

A. McPherson, 128 Victoria Rd., Walkerville, has the electrical contract and W. Laesser, 432 Janette St., the painting contract for a $12,000 store being built by A. Schwartz, Victoria Ave.

McNaughton, McKay Electric Co., 15 Feery St., are wiring a business block for Malcolm McGregor, Penobscot Bldg.

Residences

Amherstburg, Ont.

Pettypieces Ltd. are excavating for two residences costing $5,000 each.

Brantford, Ont.

About Mar. 1 tenders will be called for a $22,000 residence for Dr. J. A. Phillip, 356 Colborne St. H. R. Watson, Excelsior Life Bldg., Toronto, architect.

Hamilton, Ont.

A. W. Morris, Collegiate Institute, wants tenders on a $12,000 residence. G. T. Evans, Clyde Bldg., architect. Tenders received until Mar. 7.

Kincardine, Ont.

Twelve frame residences costing $1,500 each contemplated by J. A. Mackenzie, who plans to proceed with the work this spring.

London, Ont.

Excavating is in progress for a $7,000 residence for S. C. O'Neil, 418 Piccadilly St. Jos. Creighton, 701 Central Ave. is the builder.

Two residences costing $6,000 each will be built by W. C. Nickles, 423 Ridout St.

Longueuil, Que.

Thos. Ward Housing & Construction Co., 19-3rd Ave. W., will build five houses at a cost of $19,500 if the application made for a loan under the housing scheme is granted.

Montreal, Que.

Tenders will be called shortly on residences and tenements for Leon Gelinas, c/o Consolidated Sand Co., 270 Ottawa St. J. L. D. Lafreniere, 1019 St. Dennis St., architect.

One hundred semi detached residences are contemplated by Owen Roberts, 340 Kingston Ave. Work will proceed this spring.

A Trudel, 1792 Delaroche St., general contractor, contemplates building an apartment house; work to starte in May.

J. MacGregor, c/o H. Scott & Co., 26 Victoria Sq., is making repairs to an apartment house costing $18,000.

Tenders for the general contract for a $50,000 apartment house will be called about April 15 by Cajetan Dufort, 195 St. Catherine St.

Foundations are in for a residence costing $6,000 for Miss A. Wardell, 1343 St. Valier St. R. Billet, 6158 Peloquin Ave., Ahuntsic, is the general contractor.

Quebec, Que.

F. Jobin, 141 Bougainville, are building two residences costing $12,000.

St. John, Que.

Six flats, costing $25,000 proposed by V. Mailloux. J. A. S. Houle, 55 St. Francois Xavier St., Montreal, architect.

Toronto, Ont.

Plans for twelve pair of residences

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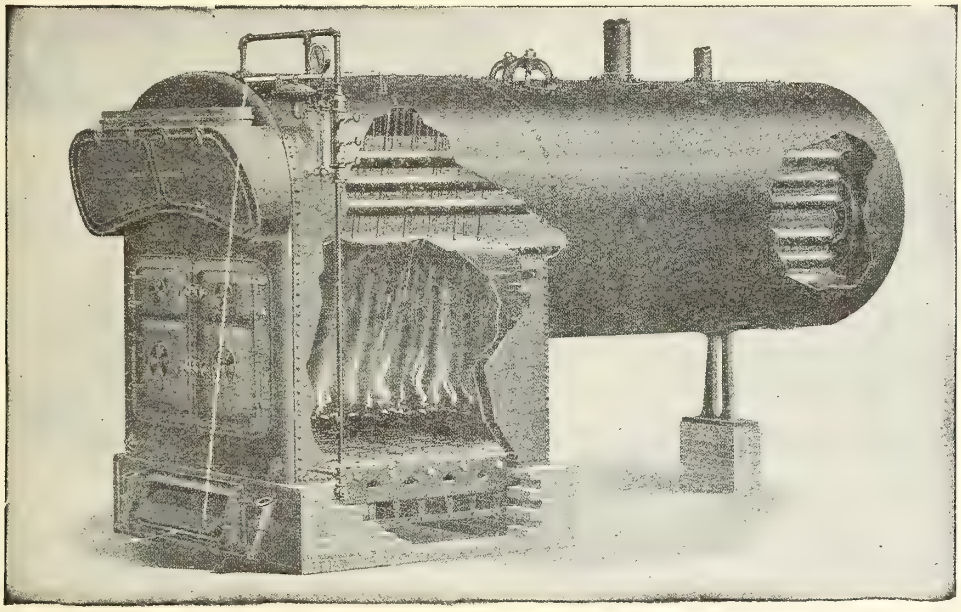

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costing $6,000 per pair are being prepared for Miss A. M. Brown, 17 Wellesley St., Toronto, by P. L. Davis, 335 Gerrard St. E.

J. Hunt Stanford & Son, 67 Yonge St. Arcade, have prepared the plans for two pair of residences costing $15,000 for Hubbs & Hubbs, 134 Victoria St. Tenders will be called shortly.

H. R. Watson, Excelsior Life Bldg., will call for tenders early in March on a $20,000 residence for J. R. Staunton.

H. R. Watson, 36 Toronto st., is preparing plans for four residences to cost about [illegible]

Three pairs and two single residences costing $28,000 proposed by W. H. Ormerod, 1524 Danforth ave. W. G. Hunt, Confederation Life Bldg. is preparing the plans and builder will let contracts.

A. C. Bannister, 50 Keystone 'ave., is excavating for six residences to cost $5,500 each.

Three pair of residences are contemplated by A. C. Bannister, 50 Keystone ave. at a cost of $6,000 a pair.

Five residences costing $6,000 each are proposed by A. Copeland, 231 Milverton Blvd. Work is expected to go ahead shortly.

Slightam Bros., 88 Hiawatha rd., have purchased the sites for eight or ten residences.

Nine residences are planned by Gaylord & Wood, 70 Eden ave. Work will start shortly.

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FIDELITY AGENCY
OF CANADA

W. Kissack, 506 Beresford ave., has the foundations in for a residence costing $7,000. Contracts for necessary small trades not yet let.

On a $20,000 residence, Martin Baldwin, architect, 43 Bloor st. E., will receive bulk and separate tenders until March 1.

Godson Home Building Co., 172 Colbeck ave., will commence work at once on a $7,500 bungalow.

H. F. Squires, general contractor, 520 Palmerston ave., will start work shortly on a residence costing $12,000.

Dr. Glendening, c/o E. G. Wilson, architect, 42 Langley ave., is having plans prepared for a residence costing $30,000. Work will proceed this spring.

B. Grant, Woodycrest ave., has purchased the site on which he proposed to build three residences costing $25,000.

J. E. Willson, 510 Lansdowne ave., has excavated for a $10,000 residence. Tenders being received on all trades.

Bulk and separate tenders on a residence to cost about $15,000 being received by E. G. Wilson, 42 Langley ave.

W. R. Kay, 16 Hazelton ave., has decided to build a $7,500 duplex residence and work will commence shortly.

Two residences in Rosedale planned by W. W. Reid, 87 Pleasant Blvd.

Windsor, Ont.

A. $10,000 addition to an eight family flat will be built by U. Jacques, 600 Dougall ave. Gilbert Jacques 3 Oulette ave., architect.

Peter Osterhout, Exchange Building, will build a residence on Giles Blvd., costing $8,000.

Walker Linden & Co., 116 Chatham st., are excavating for a $24,000 residence for Dr. P. A. Dewer, 501 Oulette ave. Cameron & Ralston, Barlett Bldg., architects.

CONTRACTS AWARDED

Hamilton, Ont.

Bloom & Brittain, 121 James st. S., have the contracts for plumbing and heating for apartments being built by Geo. E. Mills, 614 King st. E.

London, Ont.

The general contract for a $7,000 residence for T. C. O'Neil has been awarded to Creighton Woodwork Co., 701 Central ave. Peoples' Electric Co. have the electrical contract and Parker and Allen the plastering contract.

Toronto, Ont.

Clegg Bros., St. Clair ave. W., have the electrical contract and G. Chamberland, New Toronto, the plastering contract for a $12,000 residence being built by J. Lee, 20 Concord Ave.

Power Plants Electricity and Telephones

Blenheim, Ont.

Plans are being prepared to to extend electric power lines from Blenheim to Cedar Springs, Erieau & Erie Beach. This work will be carried out under the supervision of V. A. Beacock, engineer,

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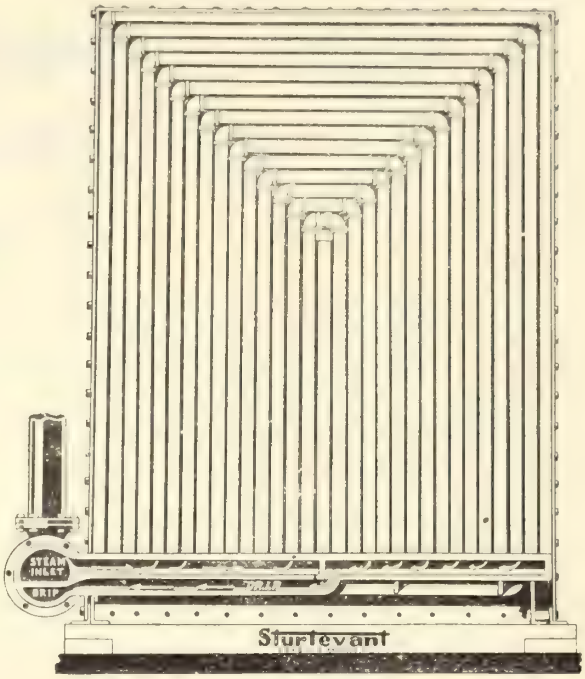

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PUTS AIR TO WORK

190 University ave., Toronto, and may go ahead about the middle of March. Cost estimated at $40,000.

London, Ont.
C. P. Telegraph Company contemplates putting all wires in the downtown district underground. [illegible] superintendent.

Moncton, N. B.
City Council contemplates improvements to the lighting system costing $5,000.

Monkton, Ont.
Hydro electric lighting and power system is contemplated. Plans also included the extension of the line to Bornholm. Plans and estimates being prepared by Engineer Castor, 190 University ave., Toronto. W. Scott, reeve.

Miscellaneous

Caledonia, Ont.
Skating rink costing $10,000 contemplated by the Town Council. Mark Senn, M.P., interested.

Fredericton, N. B.
Two steel tanks, costing $25,000, contemplated by the city. C. S. R. Pennins, clerk.

London, Ont.
Because all tenders received for supplies were considered too high, city will purchase supplies in the open market. S. Baker, clerk.

Ottawa, Ont.
Ottawa Improvement Commission contemplates the purchase of 1923 supply of refined tar. Alex. Stuart, Fraser Bldg., engineer.

Toronto, Ont.
The G. Ker Co. Ltd., recently incorporated, will carry on as a construction and land company. Head Offices in Ottawa.

Belmont Realty Co. Ltd., Head Office, Toronto, will deal in real estate and erect buildings.

The incorporation of the Greenburn Sand & Gravel Co. Ltd., with Head Office in Toronto, is advised in the current issue of the Ontario Gazette. The company deal in sand, stone, cement, etc. and operate as builders and contractors.

Fires

Carleton, P. E. I.
Store and warehouse owned by Lords Ltd., was destroyed by fire at a loss of $10,000.

Montmagny, Ont.
La Machine Agricole de Montmagny was destroyed by fire and loss is estimated at $30,000.

Ottawa, Ont.
Store and apartments owned by K. Kohen gutted by fire at an estimated loss of $20,000.

Quebec, Que.
Loss of $10,000 when residence owned by G. H. Blais was destroyed by fire. Will re-build at once.

BULLETIN No. 8

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IF THE MOTHER RAIL STANDS UP UNDER THE POUNDING AND VIBRATION OF THE LOCOMOTIVE, WHY SHOULD THE LITTLE BABY RAIL STEEL RODS IN THE CONCRETE GIRDER BELOW FALL DOWN?

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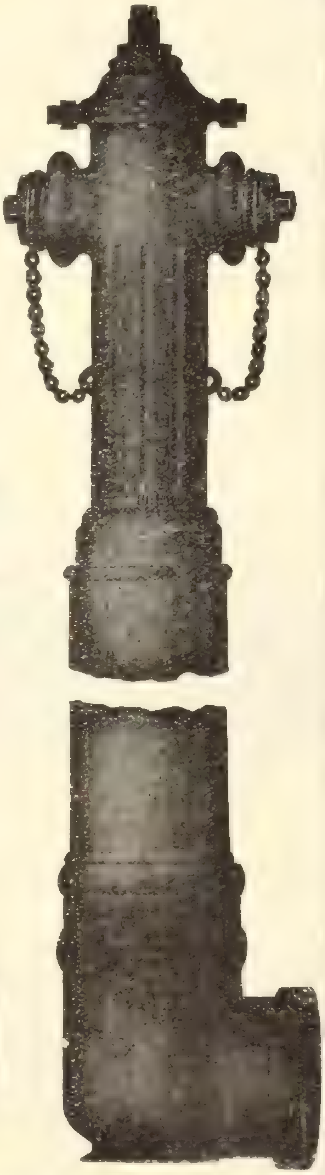

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"Hand Book of Hydraulics," by Horace Williams King. 1st edition published by McGraw-Hill Book Co., Inc. 424 pages. Price $3.50.

"Handbook of Building Construction," by George A. Hool and Nathan C. Johnson. Two volumes, (not sold separately,) 1474 pages, illustrated. Published in 1920 by McGraw-Hill Book Co., Inc. Price $12.00.

"Operation and Maintenance of Irrigation Systems," by S. T. Harding. First edition, published in 1917 by the McGraw-Hill Book Co., Inc. 271 pages, illustrated. Price $2.50.

"Practical Road Building," by Charles E. Foote. Just published by David McKay, 295 pages, illustrated. Price $1.50.

"Relief from Floods." The Fundamentals of Flood Prevention. Flood Protection and the means of determining proper remedies. By John W. Alvord and Charles B. Burdock. First edition published in 1918 by McGraw-Hill Book Co., Inc. 175 pages, illustrated. Price $2.00.

"Sheet-Metal Pattern Drafting and Shop Problems," by James S. Daugherty. Published in 1922 by The Manual Arts Press. 173 pages, illustrated. Price $2.50.

"Steel Bridge Designing," by Melville B. Wells, C.E. Published by Myron C. Clark Publishing Company in 1913 260 pages, illustrated. Price $2.00.

"The Engineering Index for 1920," recently published by the American Society of Mechanical Engineers, 586 pages, price $6.00.

"Use of Water in Irrigation," by Samuel Fortier. Published in 1915 by McGraw-Hill Book Company. 265 pages, illustrated. Price $2.00.

"Use of Water in Irrigation," by Samuel Fortier. Second edition. Published by McGraw-Hill Book Company, 1916 325 pages, illustrated. Price $2.50.

"Water Purification," by Joseph Ellms. Published in 1917 by McGraw-Hill Book Company. 485 pages, illustrated Price $5.00.

"Collected Papers On Acoustics," by Wallace Clement Sabine just published by the Harvard University Press. Price $4.00. 280 pages, illustrated.

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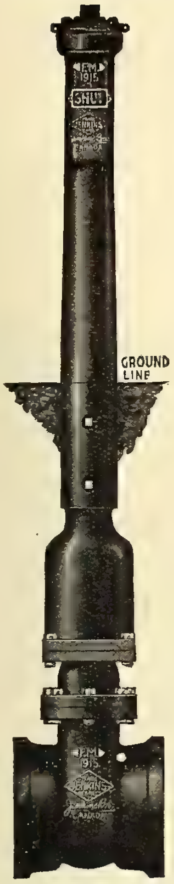

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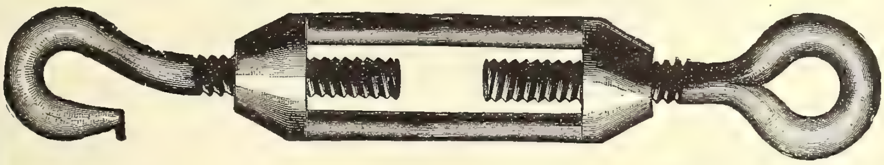

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WRITE FOR CATALOGUE

Current Prices of Building and Engineering Materials

CEMENT (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Retail lots including bags	per bbl.	$4.60	$4.16	$4.80	$3.70
Car lots, including bags	per bbl.	3.60	3.48	4.16	3.35
Refund on bags	each	.20	.20	.20	

LIME (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Lump, in retail lots	per ton	14.30	14.00	.58 bu.	2.70 bbl
Lump, in car lots	per ton	12.70**	11.00	13.80 ton*	2.60 bbl
Hydrated, in retail lots	per ton	20.00	26.00	.60 bag*	30.00
Hydrated, in car lots	per ton	19.00	21.00	.54 bag*†	25.00

BRICK and TILE (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Common face brick	per M.	24.00	16.50*	19.00	30.00
No. 1 dry pressed brick	per M.	31.00	30.00	36.00	70.00
No. 2 dry pressed brick	per M.	29.00	25.00	32.00	
Enamelled brick	per M.	125 up to	230.00	185.00	150.00
Wire cut brick, for foundation work	per M.	21.00	19.00		50.00
Sand lime brick	per M.	17.00		18.00	
Hollow building tile	per M.			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	60-95	60-75	85-100	80.00
Fire clay	per ton	13-20	15-16.00	35.00**	22.00

STONE, SAND and GRAVEL (f.o.b. cars on siding):—		Toronto	Montreal	Winnipeg	Vancouver
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.00 yd.
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 "	" "
Crusher run	per ton	2.20½		3.00 "	" "
Rubble stone	per ton	2.45	1.70	15.00 cord	" "
Gravel, 2 in. screened	per ton	2.05		2.45 yd.	" "
Gravel 1 in. screened	per ton	2.31	1.50	2.75 "	" "
Sand, screened	per ton	1.42½	1.25	1.90 "	" "
Pit run	per ton	1.52¼	1.25	1.90 "	" "

STEEL and IRON (f.o.b. warehouse):—		Toronto	Montreal	Winnipeg	Vancouver
Mild steel bars, ¼ in. and heavier	per 100 lbs.	3.25 base	3.25 base	4.35	$4.00
Bands 3/16 in. and lighter	per 100 lbs.	3.75 "	3.25 "	4.85 base	
Hoops	per 100 lbs.	4.50 "	4.25 "		
Twisted and deformed bars	per 100 lbs.	3.35 "	3.25 "	4.20	4.00
Angles, channels and tees under 3 in.	per 100 lbs.	3.35 "	3.75 "	4.95	6.00
Structural shapes	per 100 lbs.	3.60 "	3.75 "	4.75	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.50	3.50	4.75	6.25
Plates—3/16 in.	per 100 lbs.	3.70	3.85	5.15	6.50
Plates—10 gauge	per 100 lbs.	4.25	4.00	5.45	6.50
Black sheets—28 gauge	per 100 lbs.	5.00 "	4.50 "	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.20 "	6.00 "	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	6.20 "	6.50 "	7.70	8.25-8.50
Rivets	per 100 lbs.	5.75 "	5.50 "	7.00 base	
Cast iron pipe	per ton	60.00	55.00		

VITRIFIED CLAY PRODUCTS (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Sewer pipe, 4 in.	per ft.	.40	.30	.35	.28
Sewer pipe, 6 in	per ft.	.60	.45	.45	.48
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.55
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.70
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.85
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00	.90	.65	.75
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		50 % car lots	50 %	5 %	

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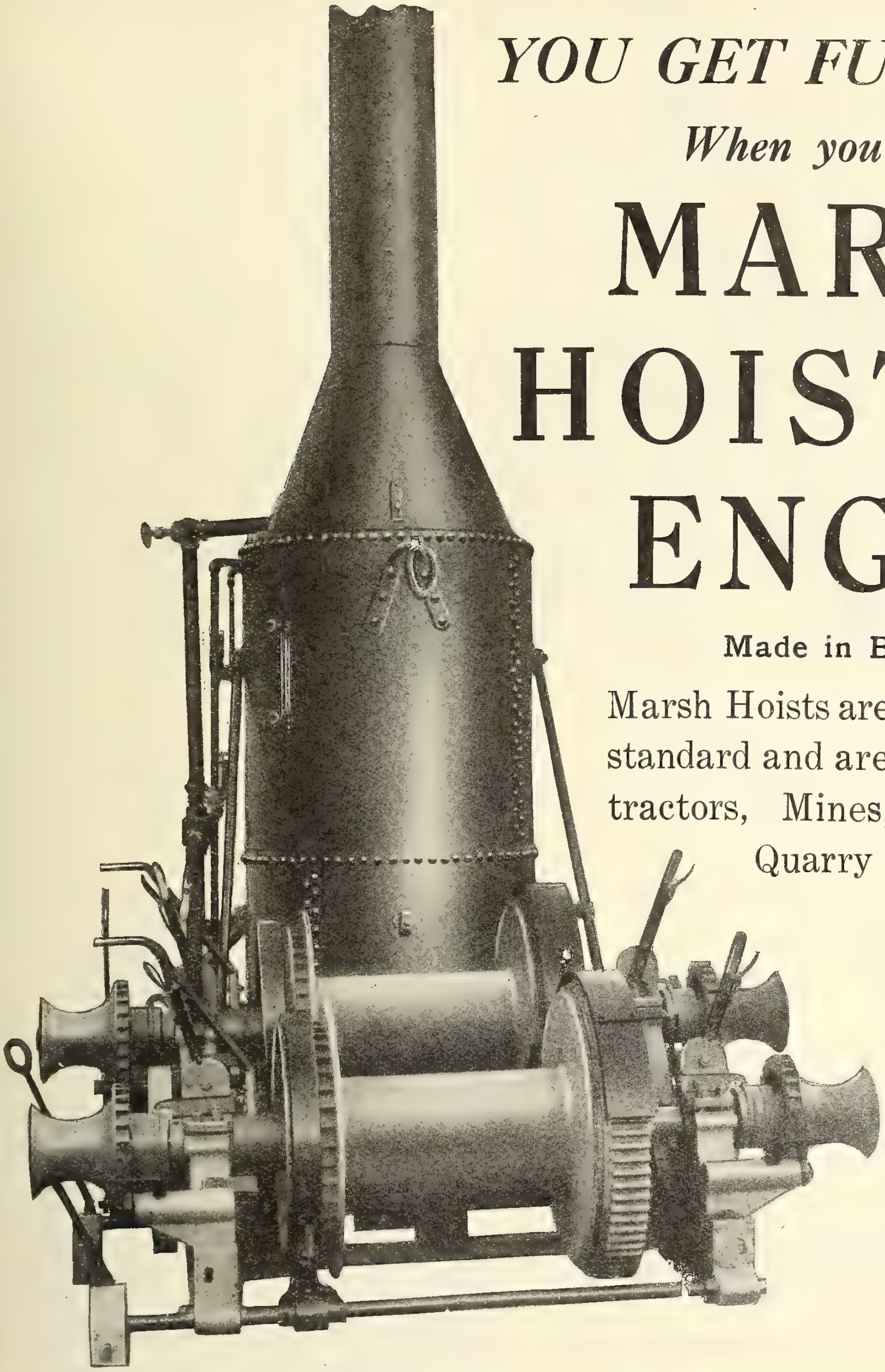
BRICK AND TILE—*f.o.b. plant.
STONE SAND AND GRAVEL:—*Winnipeg prices subject to 5% disco **Toronto prices include sales tax.



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Flooring, 1 x 3 and 4 in., clear, E. G. fir	per M.	90,00	60.00	84.00	55.00
Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	70.00	65.00	56.00	30.00
Flooring, No. 1 pine	per M.	70.00	80.00	64.80	
Flooring, No. 1 Spruce	per M.	48.00	40.00	39.60	
Flooring, birch and maple, 13/16 in. clear	per M.	130.00	110.00	152.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	130.00	125.00	140.00	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	70.00	60.00	56.00	30.00
V joint, No. 1 pine	per M.	70.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	43–58	45.00	63.75	
Red and Jack Pine, 2 x 4 to 12 in., com. rough	per M.	44/58	70.00	36.00	
Hemlock, 2 x 4 to 12 in.	per M.	40/44	40.00	36.00	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	40–50.00	50.00	36.00	11.00-13.50
Spruce, 1 and 2 x 4 to 12 in.	per M.	44/58	45-35	36.00	
Timbers, fir, 10 x 10 in. and up	per M.	63.00	58.00	47.00 base	17.-22.00
Lath, No. 1 white pine	per M.	16.00	12.00	12.00	
Lath, M. R. spruce	per M.	10.00	8.50	10.00	7.00
Shingles, XXX B.C. cedar	per M.	6.50	5.00	5.25	3.40
XX B.C. cedar	per M.	5.00	4.25	3.75	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	108.00	55.00
Fir casing	per M.	1 ct. per in.	100.00	108.00	

PAINTS, OILS, COLOURS (delivered):—

		Toronto	Montreal	Winnipeg	Vancouver*
White lead ground in oil, less than ton lots	per cwt.	14.55	13.75	14.85	15.80
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	22.00
Putty in bulk	per cwt.	5.45	4.25	5.50	9.25
Steel sash putty in bulk	per cwt.	5.95	6.00	8.75	7.75
Boiled linseed oil, in bbls.	per gal.	1.20	1.14	1.13	1.28
Raw linseed oil, in bbls.	per gal.	1.23	1.12	1.10	1.25
Turpentine, in bbls.	per gal.	2.20	2.10	2.15	1.60
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 4/5	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 1/5	.45

PLASTER (Delivered):—

		Toronto	Montreal	Winnipeg	Vancouver*
Hard wall plaster, sanded	per ton	13.50	15.00	25.00	30.00
Plaster of paris, in bbl. lots	per bbl.	6.00	5.35	1.60 bag*	7.50
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu.	1.50

LABOR:—

		Toronto	Montreal	Winnipeg	Vancouver*
Bricklayers	per hr.	1.00	.80–.90	1.15	1.06¼
Structural Iron Workers	per hr.	.85	.50–.75	1.25	1.00
Plasterers	per hr.	1.00	.80	1.05	1.06¼
Hoisting Engineers	per hr.	.70–.80	.50	.90–1.10	1.00
Plumbers	per hr.	.90	.60–.75	1.00	.90
Carpenters	per hr.	.80	.65	.90	.81¼
Painters	per hr.	.75	.55–.65	.80	.81¼
Electrical Workers	per hr.	.80	.65	.70– .90	1.00
Roofers	per hr.	.65	.65		.90
Laborers	per hr.	.40–.50	.30	47½–.55	.50–.56¼
Sheet Metal Workers	per hr.	.75			.90

LUMBER:—*Owing to the general unstable condition of the present lumber market, Vancouver dealers refuse to quote any prices at all especially for Prairie or Eastern publication. The prices are, moreover, fluctuating from day to day. Such prices as we quote are, therefore, averages and not standard.

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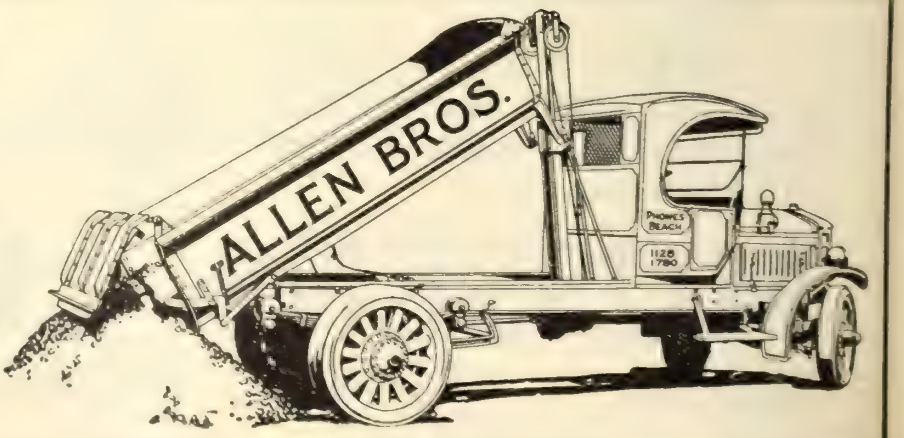

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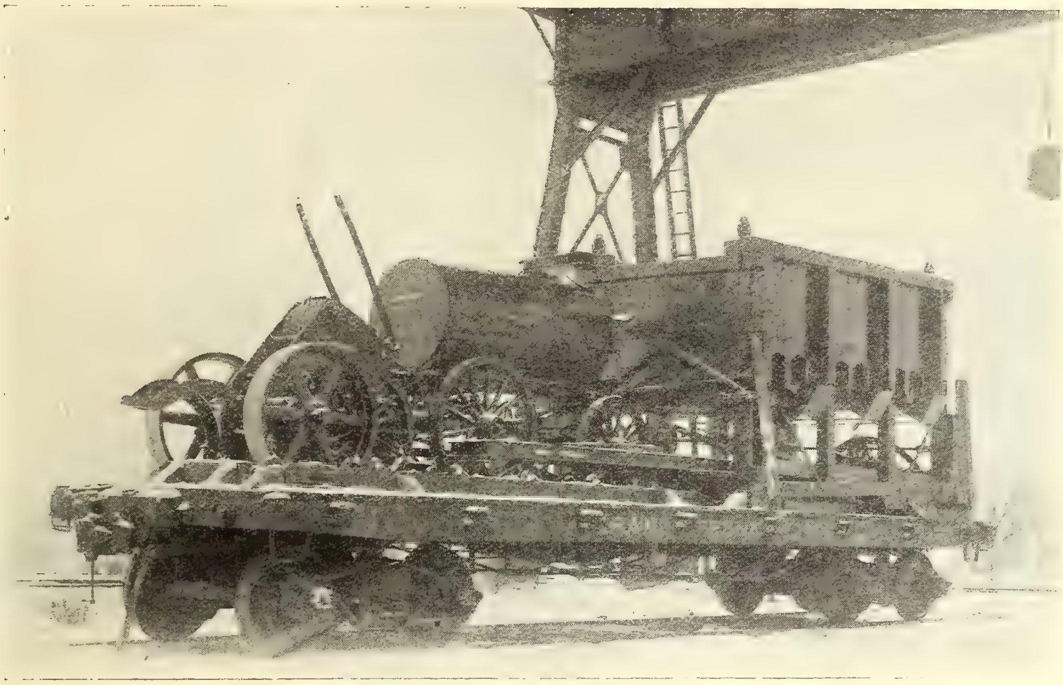

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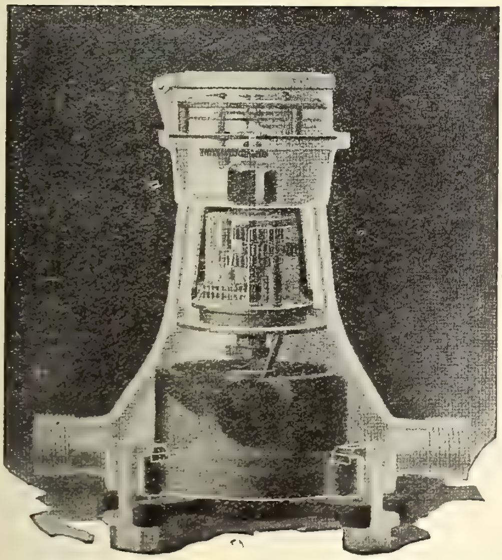

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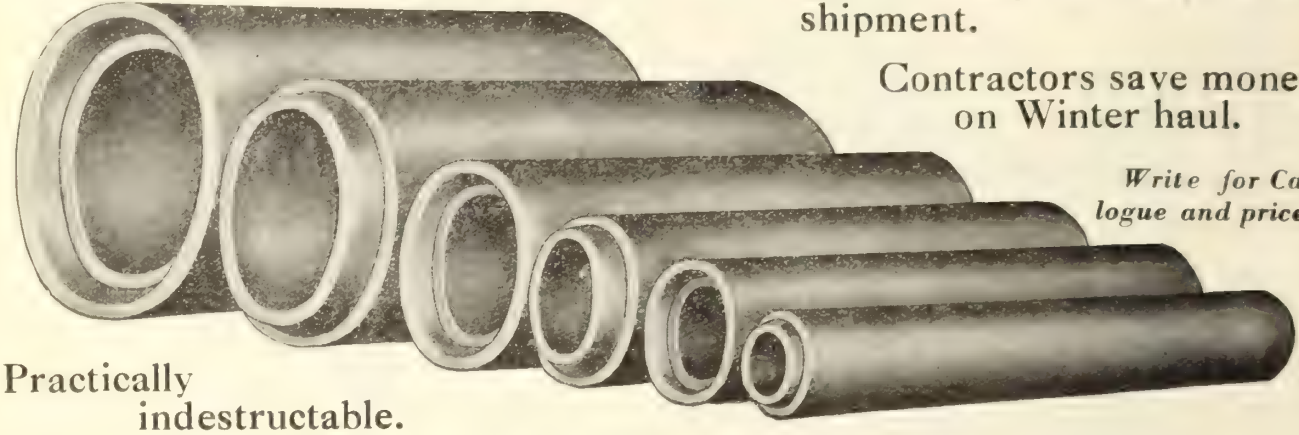

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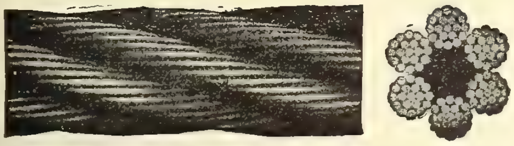

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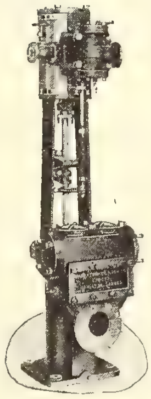

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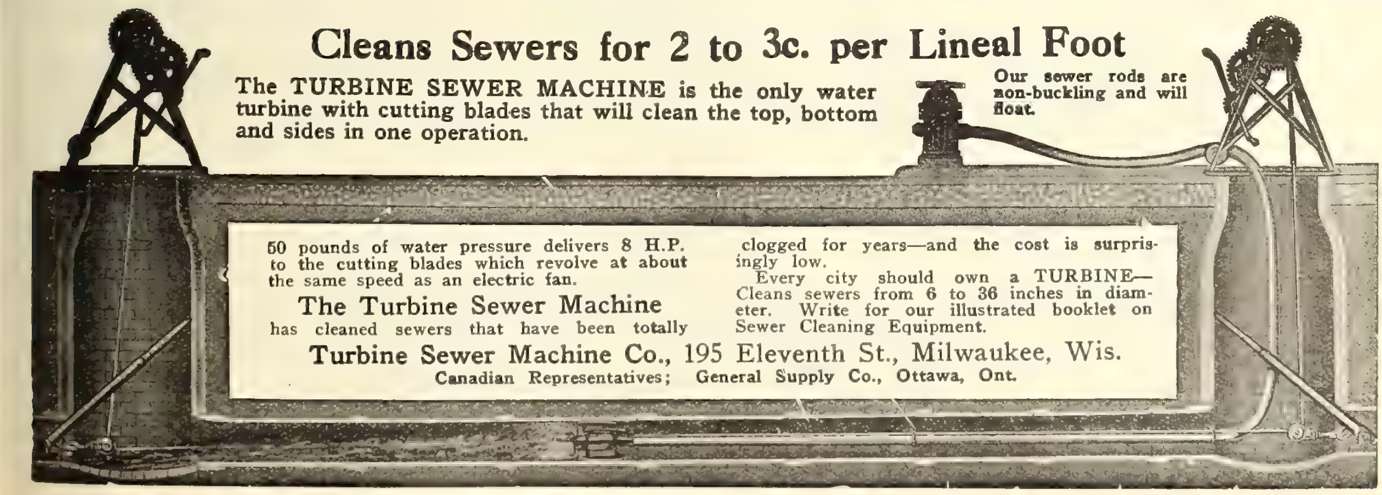

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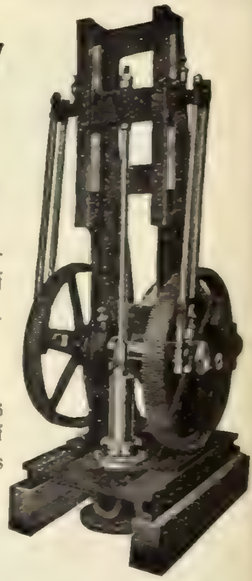

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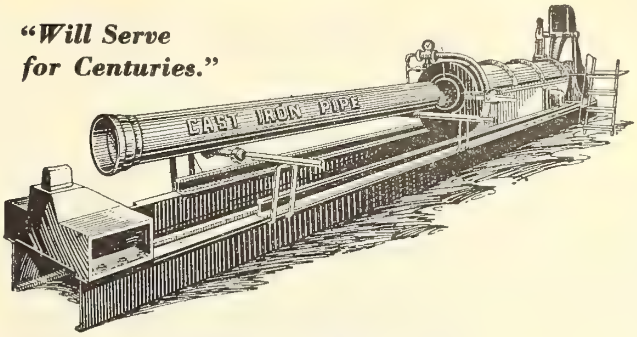

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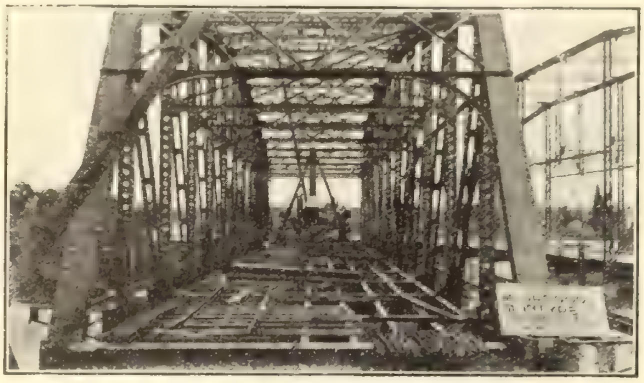

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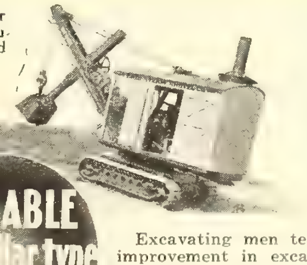

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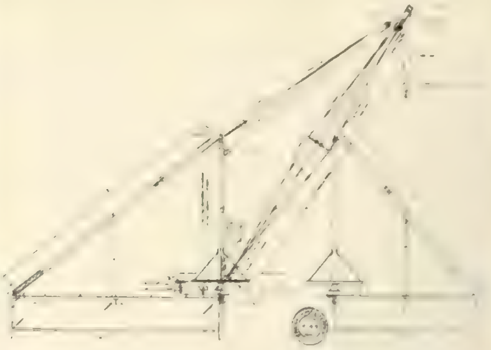

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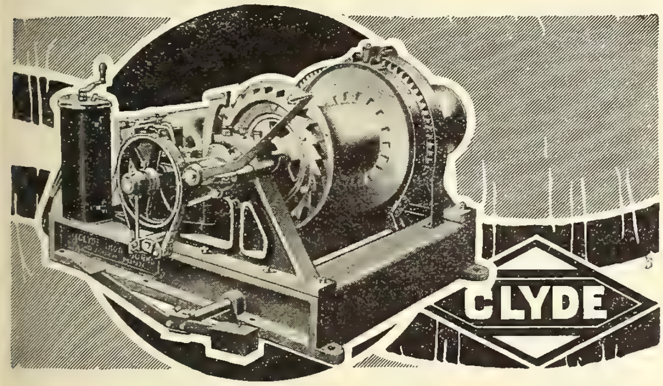
SAUERMAN DRAGLINE CABLEWAY EXCAVATORS
dig, convey, elevate and dump in one operation

Clyde Electric Hoists



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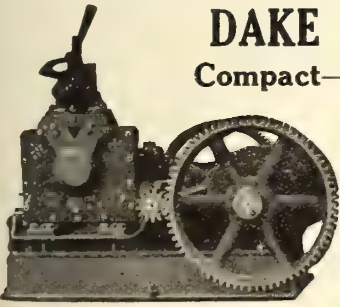

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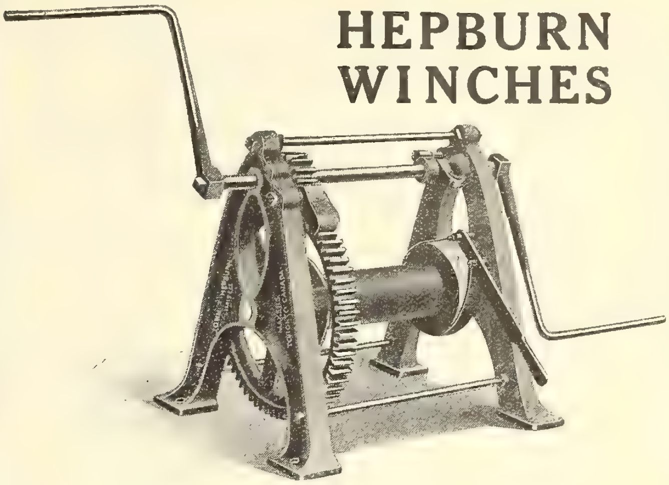

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Clam Shell and Orange Peel Buckets

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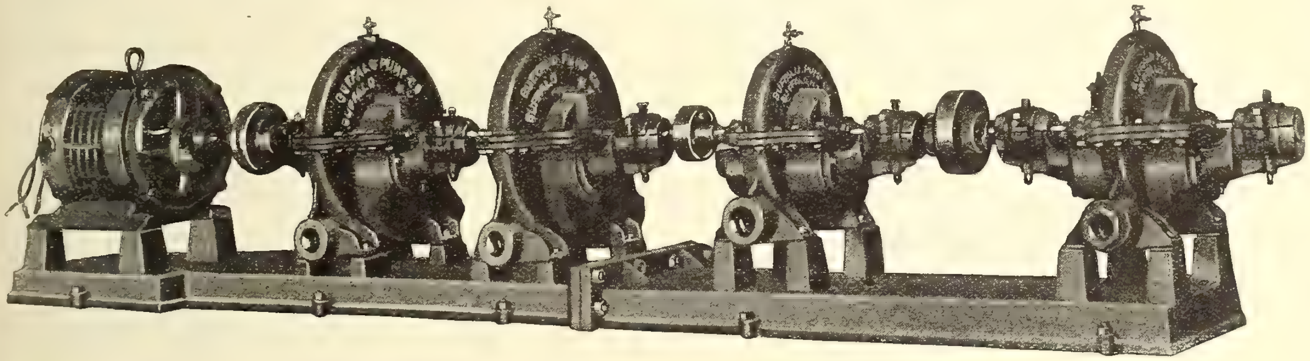

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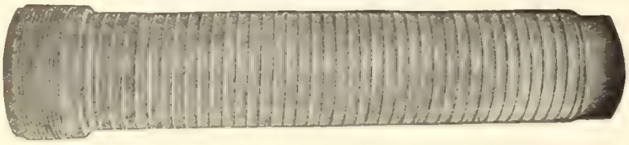

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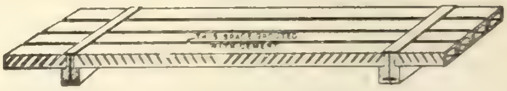

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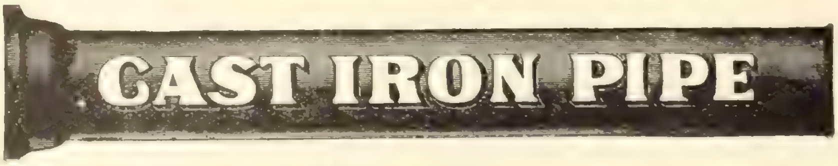

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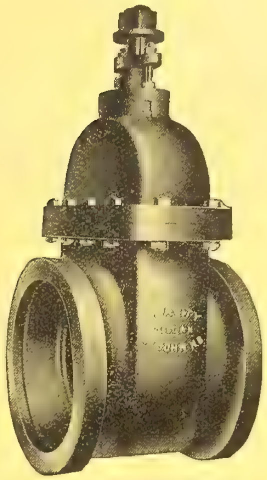

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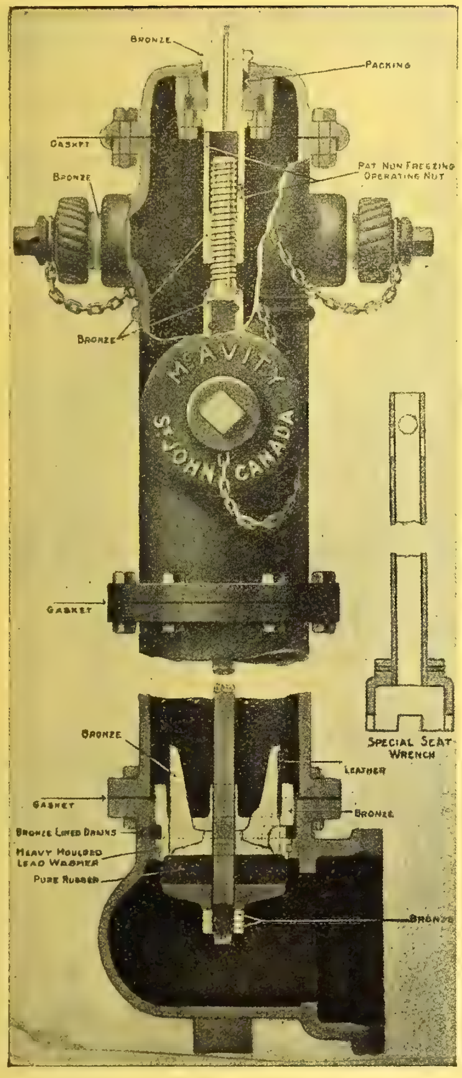

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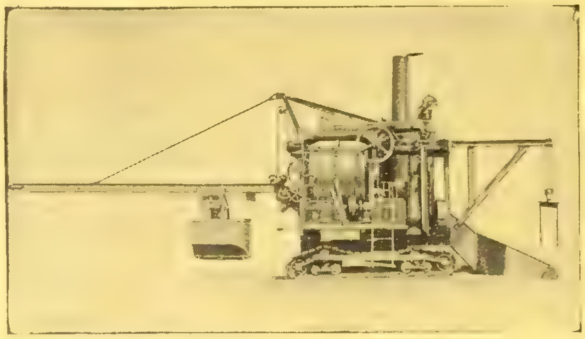

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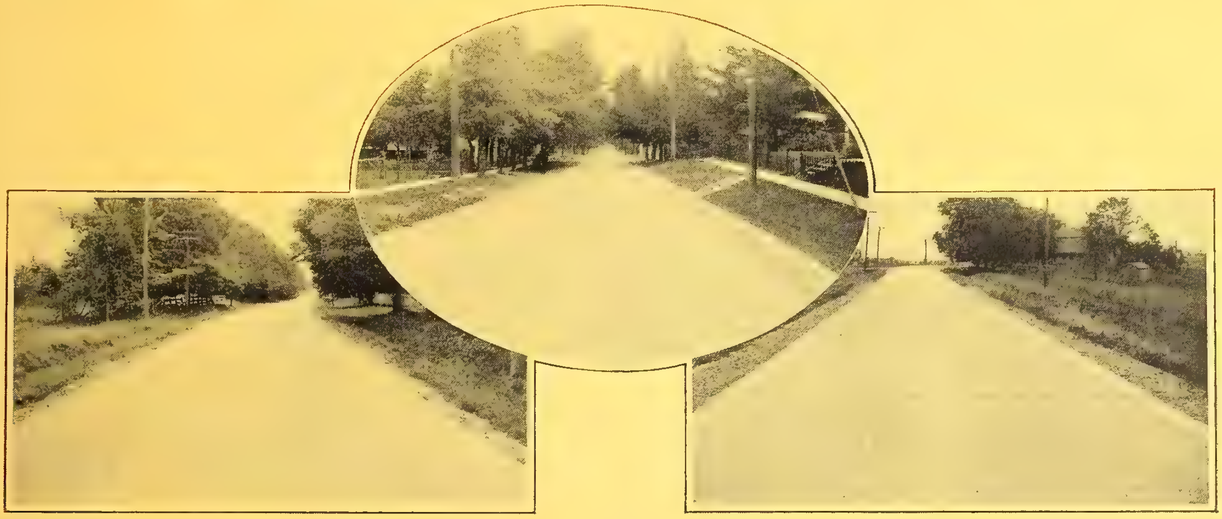

Top— Passing through Ancaster.
Left— Near Radial Station 13.
Right— At Duff's Corners.

On the Brant Highway

One of the chief links in the Ontario Provincial Highway System to be completed last year, was that section of the Brant Highway from the foot of Ancaster mountain westward through the village of Ancaster to the Brant line—and here again Asphalt was laid.

The type of construction was 3″ Hot-Mix Asphalt, (1½″ Asphalt Binder and 1½″ Sheet Asphalt) over a crushed stone base. The Asphalt driveway is 20′ wide with loose stone shoulders. The Provincial Contracting Company, Limited, carried out the contract under the supervison of Deputy Minister W. A. McLean and Chief Engineer G. Hogarth of the Department of Public Highways, and completed the work in a very capable manner and in schedule time. It was our pleasure to co-operate with our usual prompt deliveries of Imperial Asphalt.

What with the excellent workmanship and the type of pavement chosen, the Brant Highway, one of the chief outlets of the City of Hamilton, is now well equipped to serve that important area and to carry the large increase in both local and through traffic that will surely develop.

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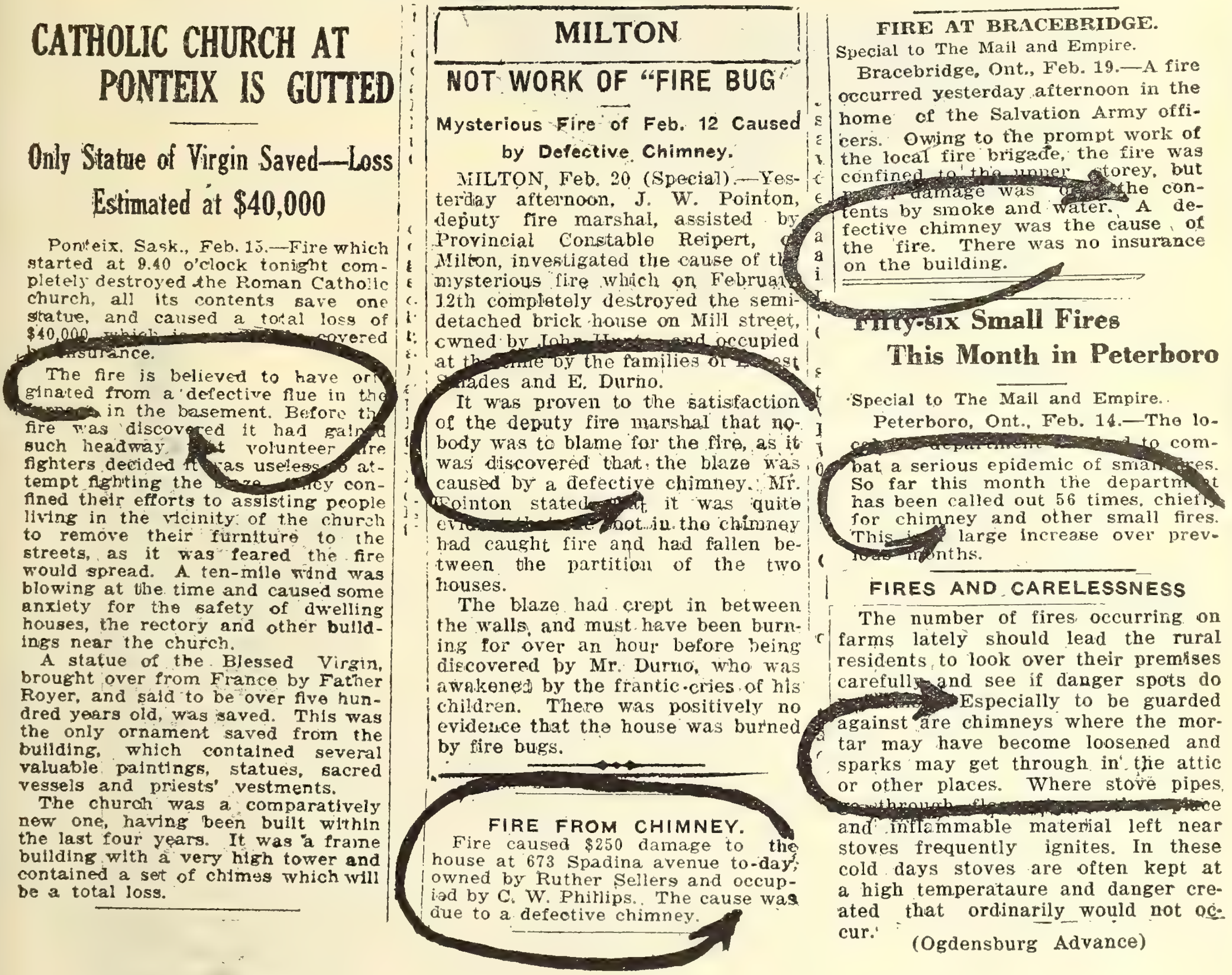
WIRE WOUND PIPE

Canadian Pipe Company, Ltd.

550 Pacific St., VANCOUVER, B. C.

If you read the papers

you will notice how many disastrous fires are caused by defective flues and chimneys. The National Board of Fire Underwriters place defective flues and chimneys as third in the list of major fire causes and responsible for the heaviest fire losses. Read these clippings for one week in February 1923.



CATHOLIC CHURCH AT PONTEIX IS GUTTED

Only Statue of Virgin Saved—Loss Estimated at $40,000

Ponteix, Sask., Feb. 15.—Fire which started at 9.40 o'clock tonight completely destroyed the Roman Catholic church, all its contents save one statue, and caused a total loss of $40,000 which is [illegible] covered by insurance.

The fire is believed to have originated from a defective flue in the furnace in the basement. Before the fire was discovered it had gained such headway that volunteer fire fighters decided it was useless to attempt fighting the blaze. They confined their efforts to assisting people living in the vicinity of the church to remove their furniture to the streets, as it was feared the fire would spread. A ten-mile wind was blowing at the time and caused some anxiety for the safety of dwelling houses, the rectory and other buildings near the church.

A statue of the Blessed Virgin, brought over from France by Father Royer, and said to be over five hundred years old, was saved. This was the only ornament saved from the building, which contained several valuable paintings, statues, sacred vessels and priests' vestments.

The church was a comparatively new one, having been built within the last four years. It was a frame building with a very high tower and contained a set of chimes which will be a total loss.

MILTON

NOT WORK OF "FIRE BUG"

Mysterious Fire of Feb. 12 Caused by Defective Chimney.

MILTON, Feb. 20 (Special).—Yesterday afternoon, J. W. Pointon, deputy fire marshal, assisted by Provincial Constable Reipert, of Milton, investigated the cause of the mysterious fire which on February 12th completely destroyed the semi-detached brick house on Mill street, owned by John [illegible] and occupied at the time by the families of [illegible] Shades and E. Durno.

It was proven to the satisfaction of the deputy fire marshal that nobody was to blame for the fire, as it was discovered that the blaze was caused by a defective chimney. Mr. Pointon stated that it was quite evi[illegible] soot in the chimney had caught fire and had fallen between the partition of the two houses.

The blaze had crept in between the walls, and must have been burning for over an hour before being discovered by Mr. Durno, who was awakened by the frantic cries of his children. There was positively no evidence that the house was burned by fire bugs.

FIRE FROM CHIMNEY.

Fire caused $250 damage to the house at 673 Spadina avenue to-day, owned by Ruther Sellers and occupied by C. W. Phillips. The cause was due to a defective chimney.

FIRE AT BRACEBRIDGE.

Special to The Mail and Empire.

Bracebridge, Ont., Feb. 19.—A fire occurred yesterday afternoon in the home of the Salvation Army officers. Owing to the prompt work of the local fire brigade, the fire was confined to the upper storey, but [illegible] damage was [illegible] the contents by smoke and water. A defective chimney was the cause of the fire. There was no insurance on the building.

Fifty-six Small Fires This Month in Peterboro

Special to The Mail and Empire.

Peterboro, Ont., Feb. 14.—The local [illegible] department [illegible] to combat a serious epidemic of small fires. So far this month the department has been called out 56 times, chiefly for chimney and other small fires. This [illegible] large increase over previous months.

FIRES AND CARELESSNESS

The number of fires occurring on farms lately should lead the rural residents to look over their premises carefully and see if danger spots do [illegible]. Especially to be guarded against are chimneys where the mortar may have become loosened and sparks may get through in the attic or other places. Where stove pipes [illegible] place and inflammable material left near stoves frequently ignites. In these cold days stoves are often kept at a high temperataure and danger created that ordinarily would not occur.

(Ogdensburg Advance)

If you want to know

what the most progressive municipal authorities are doing to eliminate this serious risk of fire, if you are engaged in fire prevention or fire fighting, or if you are interested in building construction either as architect, builder or home owner and want to prevent chimney fires write to

"FIRESTOP" Room 203, Burnside Building, Toronto, Ontario

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FOR WELDING AND CUTTING.
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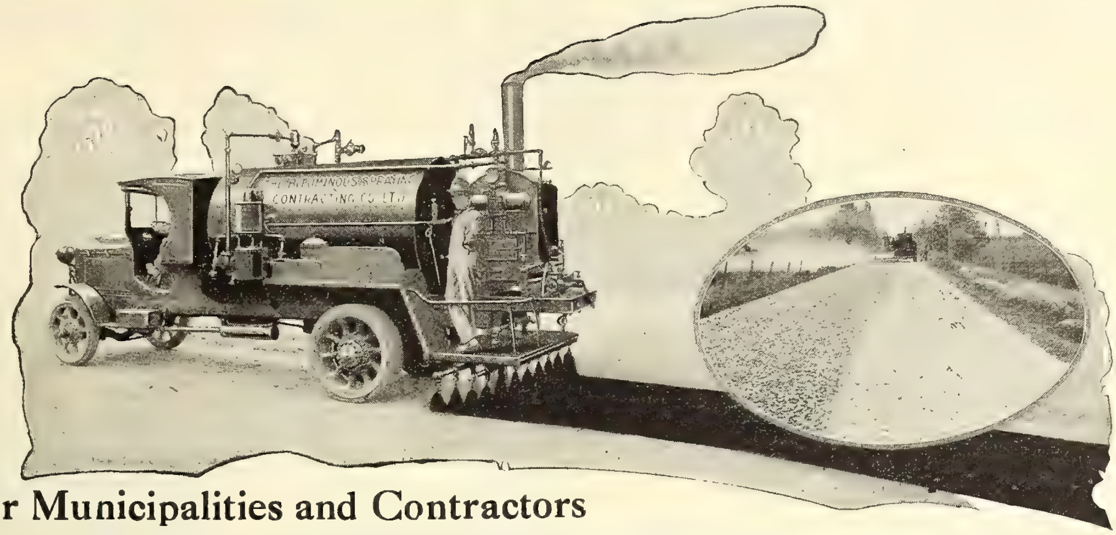

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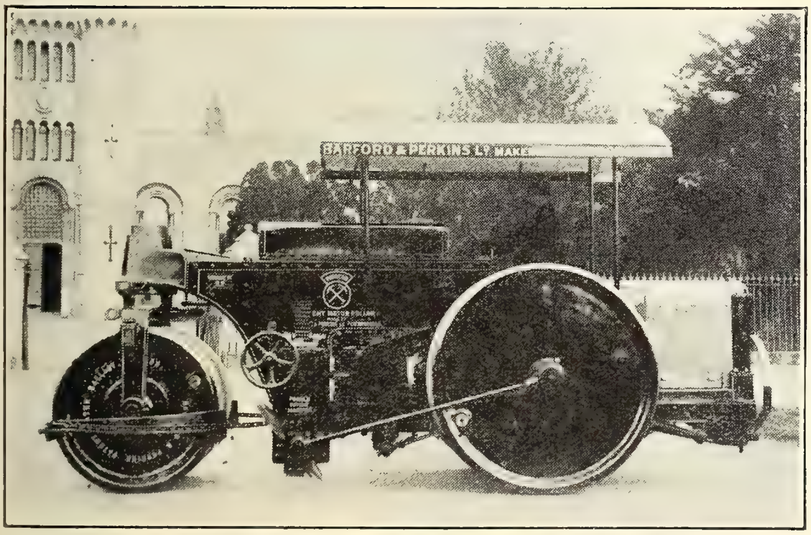

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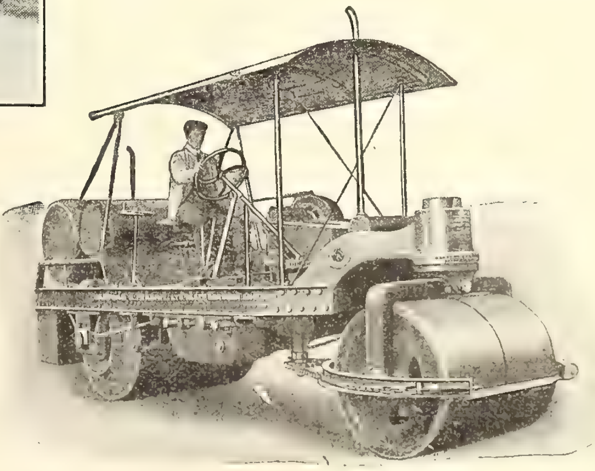

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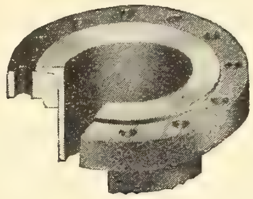
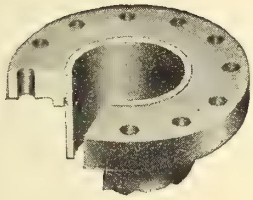
  - London Concrete Machry. Co.
  - McGovern, T. J.
  - McDougall Co., Ltd.
  - Mussens Limited
  - Orton & Steinbrenner Co.
  - Osgood Company
  - Thew Shovel Co.
  - Turnbull & Co., Harvard
  - Webster & Trory
- Conveying Appliances
  - Canadian Austin Machinery
  - Mussens Limited
- Cranes, Travelling and Locomotive
  - Ball Engine Co.
  - Canadian Austin Machinery
  - Canadian Equipment Co.
  - Canadian Link-Belt Co.
  - Canadian Mead-Morrison Co.
  - Clyde Iron Works Sales Co.
  - Crane Limited
  - Erie Steam Shovel Co.
  - Hopkins & Co., Ltd., F. H.
  - Hepburn, Ltd., John T.
  - Koehring Co., of Canada
  - Mussens Limited
  - Orton & Steinbrenner Co.
- Creosote Oils
  - Britnell, Limited
  - Dom. Tar & Chemical Co., Ltd
- Crushed Stone and Granite
  - Canada Crushed Stone
  - Crushed Stone, Limited
  - Hagersville Crushed Stone Co.
  - Hagersville Contracting Co.
  - Hagersville Quarries Ltd.
  - Queenston Quarries Co.
  - Rogers Supply Co.
  - Standard Lime Co.
  - Standard White Lime Co.
- Crushers (Stone and Rock)
  - Canadian Ingersoll Rand Co.
  - Dominion Road Machry. Co
  - Hopkins & Co., Ltd., F. H.
  - London Concrete Machry. Co.
  - Mussens Limited
  - Rogers Supply Co.
- Cut Stone
  - Oakley & Sons, Geo.
  - Queenston Quarries Co.
- Cutting Edges
  - Shunk Mfg. Co.
- Damp Proof Coating
  - Barrett Company, Ltd.
  - Imperial Oil Company, Ltd.
  - Dom. Tar & Chemical Co., Ltd
- Derricks and Derrick Fittings
  - Canadian Mead-Morrison Co.
  - Clyde Iron Works Sales Co.
  - Hepburn, Ltd., John T.
  - Hopkins & Co., Ltd., F. H.
  - Mussens Limited
  - Turnbull & Co., Harvard
- Ditchers
  - Buckeye Traction Ditcher Co.
  - Canadian Austin Machinery
  - Mussens Limited
- Ditching Machines
  - Ball Engine Co.
  - Buckeye Traction Ditcher Co.
  - Canadian Austin Machinery
  - Erie Steam Shovel Co.
  - Mussens Limited
- Doors (High Grade)
  - Pannill Door Co.
- Drafting Supplies
  - Geo. Vincent
- Drag Line Excavators
  - Canadian Austin Machinery
  - Canadian Equipment Co.
  - Koehring Co., of Canada
  - Mussens Limited
  - Orton & Steinbrenner Co.
- Dredging Pumps
  - Canadian Blower & Forge Co.
- Dredges
  - Canadian Equipment Co.
  - Canadian Mead-Morrison Co.
  - Hopkins & Co., Ltd., F. H.
  - Mussens Limited
- Drills
  - Hopkins & Co., Ltd., F. H.
- Duct Work
  - Sturtevant, B. F. & Co.
- Dust Blowers
  - Sturtevant, B. F. & Co.
- Dump Bodies
  - Dominion Truck Equipment Co.
- Dump Cars, Wheels, etc.
  - Canadian Equipment Co.
  - Hopkins & Co., Ltd., F. H.
  - MacKinnon Steel Company
  - Mussens Limited
- Drying Apparatus
  - Canadian Blower & Forge Co.
  - Sturtevant, B. F. & Co.
- Electric Fans
  - Sturtevant, B. F. & Co.
- Electric Water Systems
  - H. Mueller Mfg. Co., Limited

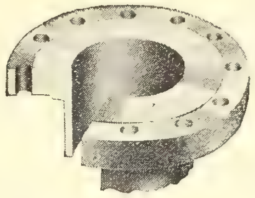
(Continued on page 8)



No. 181D. Cranelap
Joint with Cast Steel or
Forged Steel Flange



No. 281D Screwed
Joint with Cast Steel
or Forged Steel
Flange



No. 295E. Craneweld
Joint with Forged
Steel Flange.

CRANE

EXTRA HEAVY

FLANGED PIPE JOINTS

WITH CRANE CAST STEEL AND
FORGED STEEL FLANGES.

Cranelap Flanges are highly recommended for use in connection with pipe bends.

Manufacturers of Valves, Fittings and Piping Equipment and Distributors of Pipe, Plumbing and Heating Supplies.

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MONTREAL
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LIMITED
Head Office and Warehouse:
LONDON, ENGLAND.

Sales Offices:
BIRMINGHAM, CARDIFF,
GLASGOW, LEEDS, MANCHESTER.

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CLASSIFIED INDEX TO ADVERTISEMENTS—Continued

Railway Supplies
Gartshore, John J.
Hopkins & Co., Ltd., F. H.

Reinforcements, Concrete & Steel
Burlington Steel Company
Canada Iron & Wire Works

Reinforcement Ties
Bates Valve Bag Co.

Refrigeration Machinery
Canadian Johns-Manville Co.
York Manufacturing Co.

Rigging Screws
Hopkins & Co., Ltd., F. H.

Riveted Spans
MacKinnon Steel Company

Road Drags
Sarnia Bridge Company

Road Asphalt
Imperial Oil Company, Ltd.

Road Machinery
Barford & Perkins
Canadian Austin Machinery
Can. Fairbanks-Morse Co., Ltd.
Dominion Road Machry. Co.
Hopkins & Co., Ltd., F. H.
Koehring Co., of Canada
McGovern, T. J.
Mussens Limited
Waterous Engine Works Co.
Sauerman Bros.

Road Materials
Barrett Company, Ltd.
Dom. Tar & Chemical Co., Ltd.

Road Oil
Barrett Company, Ltd.
Imperial Oil Company, Ltd.

Road Tar
Barrett Company, Ltd.
Dom. Tar & Chemical Co., Ltd.

Roofing Contractors
A. W. Carmichael Ltd.

Roofing Cement
Barrett Company, Ltd.
Dom. Tar & Chemical Co., Ltd.

Roofing Material
Barrett Company, Ltd.
Brantford Roofing Co.
Canadian Johns-Manville Co.
Dom. Tar & Chemical Co., Ltd.
Imperial Oil Company, Ltd.
Vitrified Clay Pipe Publicity Bureau

Rope
Leckie Co., John

Rolling Steel Doors
Ormsby Company, A. B.

Rubble Stone
Queenston Quarries Co.

Sand
Allen Bros.
Paris Sand & Gravel Co.
Rogers Supply Co.
Standard Lime Co.

Screens
Canada Wire & Iron Goods Co.

Screw Plugs
Rawplug Co., of Canada
Inventions, Limited

Sewer Cleaning Machines
Turbine Sewer Machine Co.

Sewer Manholes
Philip Gies Foundry

Sewer Pipe
Britnell & Company
National Iron Works
Vitrified Clay Pipe Publicity Bureau

Sheathing
Barrett Company, Ltd.

Shingle Stain Oil
Barrett Company, Ltd.
Dom. Tar & Chemical Co., Ltd.

Shovels (Steam)
Ball Engine Co.
Canadian Austin Machinery
Canadian Equipment Co.
Canadian Mead-Morrison Co.
Erie Steam Shovel Co.
Hopkins & Co., Ltd., F. H.
McGovern, T. J.
Mussens Limited
Osgood Company
Thew Shovel Co.

Sidewalk Doors
McGregor & McIntyre

Silo Material
National Fireproofing Co.

Silo Moulds
London Concrete Machry. Co.

Smoke Stacks
Canadian Blower & Forge Co.
Hamilton Bridge Works Co.
Horton Steel Works, Ltd.
MacKinnon Steel Company
McGregor & McIntyre
Standard Steel Construction Co
Waterous Engine Works Co.

Snow Plows
Canadian Equipment Co.
Mussens Limited

Sprinkler Tanks (Steel)
Canadian Des Moines Steel Co.
Horton Steel Works, Ltd.

Stair Builders
Canada Wire & Iron Goods Co.
McGregor & McIntyre

Steam Apparatus & Specialties
Canadian Blower & Forge Co.
Canadian Ingersoll Rand Co.
McAvity & Sons, Ltd., T.

Steam Pipe Casing (Wood Stave)
British Empire Steel Corporation
Burlington Steel Company
Hopkins, & Co. F. H.
MacKinnon Steel Company
Nova Scotia Steel & Coal Co.
Standard Steel Construction Co.

Steel Bars
Burlington Steel Company
Hopkins, & Co. F. H.
Turnbull & Co., Harvard

Steel Beams
Hamilton Bridge Works Co.
MacKinnon Steel Company
Toronto Steel Construction Co.

Steel Chain
Hopkins, & Co. F. H.

Steel Curb and Gutter Forms
Heltzel Steel Form & Iron Co.

Steel Curb Forms
Heltzel Steel Form & Iron Co.

Steel Lockers
Coffey, J. G.

Steel Pipe
Canadian Des Moines Steel Co.
Horton Steel Works, Ltd.
National Equipment Company

Steel Plate Construction
Canadian Des Moines Steel Co.
Hamilton Bridge Works Co.
Horton Steel Works, Ltd.
MacKinnon Steel Company
Standard Steel Construction Co.
Sturtevant, B. F. & Co.
Waterous Engine Works Co.

Steel Road Forms
Heltzel Steel Form & Iron Co.

Steel Sash
Ormsby Company, A. B.
Can. Metal Window & Steel Products

Steel Sidewalk Forms
Heltzel Steel Form & Iron Co.

Steel Wire Rope
Canada Wire & Iron Goods Co.

Stokers
Sturtevant, B. F. & Co.

Stone
De Giorgio, Limited
Britnell & Company
Oakley & Sons, Geo.
Queenston Quarries Co.
Rogers Supply Co.
Standard Lime Co.

Stove Surfacing Machinery
Canadian Ingersoll Rand Co.

Stone Working Tools
Canadian Ingersoll Rand Co.

Structural Iron and Steel
Burlington Steel Company
Canadian Des Moines Steel Co.
Hagarty, R. E. W.
Hamilton Bridge Works Co.
Horton Steel Works, Ltd.
McGregor & McIntyre
MacKinnon Steel Company
Reid & Brown Structural Steel & Iron Works
Sarnia Bridge Company
Standard Steel Construction Co.

Swinging Gears
Clyde Iron Works
Dake Engine Co.

Tanks and Steel Pipes
Horton Steel Works, Ltd.
Canadian Des Moines Steel Co.
Hamilton Bridge Works Co.
Inglis Co., John
McGregor & McIntyre
Waterous Engine Co.

Tanks Wood
Canadian Pipe Company
Vancouver Wood Pipe and Tank Company
Pacific Coast Pipe Co.
Dom. Tar & Chemical Co., Ltd.

Tarpaulin
Leckie Co., John

Testing and Inspecting Bureau
Hunt & Company, Robt. W.
Milton Hersey Company

Tile
Erie Clay Products Ltd.
General Products Co.
Italian Mosaic & Tile Co.

Tile Moulds
London Concrete Machry. Co.

Tile Drain
Erie Clay Products Ltd.
National Fireproofing Co.

Tile Hollow
National Fireproofing Co.

Time Recorders
International Business Machines

Towers
Canadian Des Moines Steel Co.
Hamilton Bridge Works Co.
Horton Steel Works, Ltd.
Standard Steel Construction Co.

Tractors
[illegible] Mfg. Co.
Holt Manufacturing Co.
Mussens Limited

Trailers
Dominion Truck Equipment Co.
Holt Manufacturing Co.

Trucks
Commercial Cars of Canada
Holt Manufacturing Co.
Jones Motors Ltd.
Leyland Motors
Packard Ontario Motor Co.
Ruggles Motor Truck Co.

Truck Units
Dominion Truck Equipment Co.

Turbo Undergrate Blowers
Sturtevant, B. F. & Co.

Turnbuckles
Dominion Wire Rope Co., Ltd.

Unit Heaters
Sturtevant, B. F. & Co.

Vacuum Cleaners
Sturtevant, B. F. & Co.

Valves
Canada Iron Foundries
Crane Limited
Gartshore, Thompson Pipe Co.
McAvity & Sons, Ltd., T.
H. Mueller Mfg. Co., Limited
York Manufacturing Co.

Ventilating & Heating Apparatus
Canadian Blower & Forge Co.
Sturtevant, B. F. & Co.

Varnishes and Insulating
Standard Underground Cable Co., of Canada Ltd.

Ventilators
Sturtevant, B. F. & Co.

Wagons—Dump
Mussens Limited

Waterproofing
Barrett Company, Ltd.
Canadian Johns-Manville Co.
Dom. Tar & Chemical Co., Ltd.
Imperial Oil Company, Ltd.
Spielman Agencies Regd.
Builders Iron Foundry

Water Meters
Neptune Meter Co.

White Lead
Canada Paint Co.

Welding Apparatus
Prest-O-Lite Company, Inc..

Wire Cloth
Greening Wire Co., B.

Window Sash
Ormsby Company, A. B.

Wires and Cables
Greening Wire Co., B.
Standard Underground Cable Co., of Canada Ltd.

Wire Guards and Screens
Canada Wire & Iron Goods Co.

Wire Rope
Canada Wire & Iron Goods Co.
Dominion Wire Rope Co., Ltd.
Greening Wire Co., B.
Hopkins & Co., F. H.
Leckie Co., John
Mussens Limited
Canadian Pipe Company
Vancouver Wood Pipe and Tank Company

Wood Preservations
Barrett Company, Ltd.
Dom. Tar & Chemical Co., Ltd.

Truck Transportation Without Investment

THE GENERAL CONTRACTOR or road builder can now obtain reliable, efficient, high-grade truck transportation without investment and at prices often much lower than if he owned the trucks himself.

The owners of over 100 Packard Motor Trucks have asked us to act as a clearing house for them. Having years of practical experience in solving transportation problems, we are able to assist both contractor and owner in getting together on the best possible basis.

The contractor gets just the service he wants, when he wants it, as long as he wants it. The owner gets a fair price for honest work well done.

Packard Truck owners are solid, responsible business men who are zealous to build and maintain a reputation for superior service. In addition to trucks they own a large quantity of supplementary equipment such as loaders, steam shovels, clams, etc.

Whether your job is large or small you will find us and Packard Truck contractors anxious to serve you promptly, efficiently, and at reasonable prices.

It will pay you to consult us about your transportation problems.

Contractors' Transportation Dept.

Packard-Ontario Motor Co.
Limited
18 BLOOR ST. EAST, TORONTO
NORTH 3300

CLASSIFIED INDEX TO ADVERTISEMENTS—Continued

Electrical Specialties
Spielman Agencies Regd.

Elevator Doors
Ormsby Company, A. B.

Elevators
Canadian Link-Belt Co.
Otis-Fensom Elevator Co.
Turnbull Elevator Company

Enameled Brick
American Enameled Brick & Tile Company

Engines
Canadian Blower & Forge Co.
Canadian Ingersoll Rand Co.
Clyde Iron Works Sales Co.
Hopkins & Co., Ltd., F. H.
Inglis Co., John
Laurie & Lamb
Le Roy Company
Sterling Engine Co.
Waterous Engine Works Co.

Engines—Swinging
Canadian Mead-Morrison Co.
Clyde Iron Works Sales Co.

Engines (Civil and Mechanical)
Chipman & Power
Hunt & Co., Robt. W.
Milton Hersey Company
Lea, R. S. & W. S.

Engineers' Supplies
Geo. Vincent

Excavators
Ball Engine Co.
Buckeye Traction Ditcher Co.
Canadian Austin Machinery
Canadian Equipment Co.
Canadian Mead-Morrison Co.
Clyde Iron Works Sales Co.
Engineering & Machine Works Co.
Erie Steam Shovel Co.
Hopkins & Co., Ltd., F. H.
Koehring Co., of Canada
Lumsden Engineering & Contracting Co.
Monighan Machine Co.
Mussens Limited
Thew Shovel Co.

Exhausters
Sturtevant, B. F. & Co.

Exhaust Heads
Canadian Blower & Forge Co.
Sturtevant, B. F. & Co.

Fans
Canadian Blower & Forge Co.

Fans, Disc
Sturtevant, B. F. & Co.

Fans, Multivane
Sturtevant, B. F. & Co.

Fans, Propeller
Sturtevant, B. F. & Co.

Fans, Silentvane
Sturtevant, B. F. & Co.

Fibre Board
Chew, Manley

Filters, Water
Laurie & Lamb

Fireproofing
National Fireproofing Co.

Fireproof Doors and Windows
Mussens Limited
Ormsby Company, A. B.

Fire Escapes
Canadian Des Moines Steel Co.
McGregor & McIntyre
Dennis Wire & Iron Works Co.
Northern Architectural Iron

Fittings
Crane Limited
H. Mueller Mfg. Co., Limited
York Manufacturing Co.

Fixing Devices
Inventions Limited
Rawplug Co., of Canada

Flag Poles
MacKinnon Steel Company
McGregor & McIntyre

Flooring Materials
Imperial Oil Company, Ltd.
National Fireproofing Co.
Vitrified Clay Pipe Publicity Bureau

Forges
Canadian Blower & Forge Co.

Furnaces
H. Mueller Mfg. Co., Limited

Gantry and Cantilever Cranes
Orton & Steinbrenner Co.

Gasoline Engines
London Concrete Machry. Co.

Gears (Cut)
Hamilton Gear & Machine Co.

Glass
Consolidated Plate Glass Co.

Grader Blades
Shunk Mfg. Co.

Gravel
Allen Bros.
Paris Sand & Gravel Co.
Rogers Supply Co.

Gymnasium Apparatus
Coffey, J. G.

Hardware
Hardware Co., of Toronto

Hardwood Flooring
Eaton & Sons, J. R.

Hauling Contractors
Angstrom & Verochio
Lumsden Engineering & Transport Co.

Heating Apparatus
Canadian Blower & Forge Co.
Crane, Limited
Sturtevant, B. F. & Co.

Hoists, Electric
Canadian Austin Machinery
Canadian Link-Belt Co.
Clyde Iron Works Sales Co.

Hoists (Truck)
Dominion Truck Equipment Co.

Hoisting Apparatus
Canadian Austin Machinery
Canadian Ingersoll Rand Co.
Canadian Mead-Morrison Co.
Clyde Iron Works Sales Co.
Hopkins & Co., Ltd., F. H.
London Concrete Machry. Co.
Mussens Limited

Hoisting Engines
Hamilton Co., Wm.
Canadian Mead-Morrison Co.
Clyde Iron Works Sales Co.
General Products Co.
Hopkins & Co., Ltd., F. H.
Koehring Co., of Canada
London Concrete Machry. Co.
McGovern, T. J.
Mussens Limited
Turnbull & Co., Harvard

Hydrants
Canada Iron Foundries
Dominion Steel Products Ltd.
Kerr Engine Company
Gartshore-Thompson Pipe Co.
McAvity & Sons, T.
Hepburn, Ltd., John T.

Hydrated Lime
Melville Quarry Co.
Standard Lime Co.

Ice Making Machinery
Canadian Ingersoll Rand Co.
York Manufacturing Co.

Industrial Cars
Canadian Austin Machinery
Canadian Equipment Co.
Hopkins & Co., Ltd., F. H.
MacKinnon Steel Company
Mussens Limited

Inspection Engineers
Canadian Inspection & Testing Laboratories
Hunt & Co., Robt. W.
Milton Hersey Company

Insulating Compounds
Dom. Tar & Chemical Co., Ltd.
Imperial Oil Company, Ltd.
Spielman Agencies Regd.
Standard Underground Cable Co., of Canada Ltd.

Jib Cranes (all kinds)
Hamilton Bridge Works Co.

Joist Hangers
Hamilton Bridge Works Co.

Kilns
Canadian Blower & Forge Co.
Horton Steel Works, Ltd.
MacKinnon Steel Company

Lead Pencils
American Lead Pencil Co.

Lime
Standard Lime Co.

Hydrated Lime
Standard White Lime Co.

Lockers (Clothes)
Canada Wire & Iron Goods Co.

Locomotive Cranes
Ball Engine Co.
Canadian Austin Machinery
Canadian Equipment Co.
Canadian Link-Belt Co.
Erie Steam Shovel Co.
General Products Co.
Hopkins & Co., Ltd., F. H.
Koehring Co., of Canada
McGovern, T. J.
Mussens Limited
Orton & Steinbrenner Co.

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Canadian Equipment Co.

Locomotive Gasoline and Storage Battery
Canadian Austin Machinery
Fate-Root-Heath Co.
Koehring Co., of Canada

Marble
Oakley & Sons, Geo.

Metal Lath
General Products Co.
Ormsby Company, A. B.

Meters
Builders Iron Foundry

Mine Cars
Philip Gies Foundry

Motors
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Canadian Des Moines Steel Co.
Hamilton Bridge Works Co.
Hamilton Co., Wm.
Horton Steel Works, Ltd.
MacKinnon Steel Company

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Orton & Steinbrenner Co.

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Dennis Wire & Iron Works Co.

Ornamental Moulds
London Concrete Machry. Co.

Paint (Heated Surfaces)
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Spielman Agencies Regd.

Paints and Varnishes
Hopkins & Co., Ltd., F. H.
Spielman Agencies Regd.

Paints (Bridge and Structural Iron and Pipe Coating)
Britnell, Limited
Canada Paint Co.
Dom. Tar & Chemical Co., Ltd.
Imperial Oil Company, Ltd.
Spielman Agencies Regd.

Paving and Paving Materials
Barrett Company, Ltd.
Dom. Tar & Chemical Co., Ltd
Imperial Oil Company, Ltd.
Lumsden Engineering & Contracting Co.
Standard Lime Co.
Pacific Coast Pipe Co.
Vancouver Wood Pipe & [illegible]

Pencils((Lead)
American Lead Pencil Co.

Penstocks (Wood Stave)
Hamilton Bridge Works Co.
Pacific Coast Pipe Co.

Perforated Metals
Canada Iron & Wire Works

Pile Driving Machinery
Canadian Mead-Morrison Co.
Clyde Iron Works
Hopkins & Co., Ltd., F. H.
Mussens Limited

Pipe (Concrete, Iron & Wood)
Canada Iron Foundries
Canadian Pipe Co.
Dominion Concrete Company
Gartshore, Thompson Pipe Co.
National Iron Corporation

Pipe Covering (Cold and Steam)
Canadian Johns-Manville Co.

Pipe and Tapping Machines
H. Mueller Mfg. Co., Limited

Pitch
Dom. Tar & Chemical Co., Ltd.

Planing Mill Exhausters
Canadian Blower & Forge Co.

Plaster
Britnell & Company
De Giorgio, Limited

Plastering
Hynes Co., W. J.

Pneumatic Machinery
Laurie & Lamb

Power Engines
Inglis Co., John

Prisms
Luxfer Prism Co.

Propeller Fans
Sturtevant, B. F. & Co.

Pumps and Pumping Machinery
Canadian Blower & Forge Co.
Canadian Ingersoll Rand Co.
Canadian Mead-Morrison Co.
Cook, A. D.
General Products Co.
Goldie & McCulloch Co.
Hepburn, Ltd., John T.
H. Mueller Mfg. Co., Limited
Hopkins & Co., Ltd., F. H.
Inglis Co., John
Koehring Co., of Canada
London Concrete Machry. Co.
McDougall Co., Ltd.
Mussens Limited
Waterous Engine Works Co.

Quarry Machinery
Hopkins & Co., Ltd., F. H.
McGovern, T. J.
Mussens Limited

Radiators (Steam Taps)
Canadian Johns-Manville Co.

Rails
Gartshore, John J.
Hopkins & Co., Ltd., F. H.
Mussens Limited

(Continued on page 10)

The HAMILTON BRIDGE WORKS CO.,
LIMITED

HEAD OFFICE
and WORKS
HAMILTON
Canada

STRUCTURAL STEEL
Engineers, Manufacturers
and Contractors

BRANCH OFFICE
410 General Assurance Bldg.
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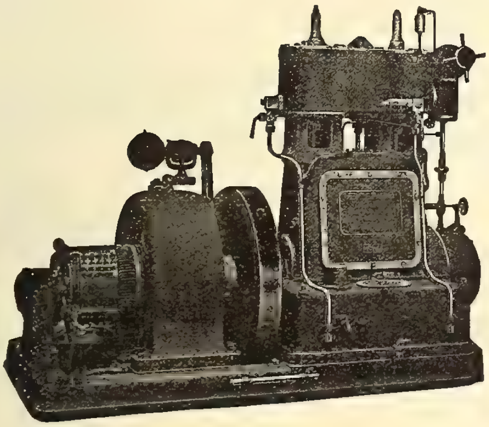
TORONTO

Steel Railway and Highway Bridges, Buildings, Girders, Crane Runways, Towers, Turntables, Trusses and Columns

We carry a large stock of Structural Shapes and Plates and your requirements can be immediately filled. Our large shops, with a capacity of 36,000 tons annually enable us to turn out whatever you require, from the largest building to a few beams, in a surprisingly short time.



Belliss Compound Engine with Generator

BELLISS & MORCOM, Ltd.
Birmingham, England

STEAM ENGINES
STEAM & EXHAUST TURBINES
DIESEL ENGINES
AIR & GAS COMPRESSORS
SURFACE & JET CONDENSERS

HEENAN & FROUDE, Ltd.
Worcester, England

Air Coolers for Electric Generators or Transformers.

Water Coolers for Internal Combustion Engines.

Oil Coolers for Steel Quenching etc.

Dynamometers.

Duval's Metallic Packing.

Semi-Metallic Packing for Centrifugal Pumps

Agents—

LAURIE & LAMB, Board of Trade Bldg., MONTREAL

CANADIAN EXPLOSIVES TRADE CXL MARK LIMITED

for

ROAD WORK

Nothing More Dependable than

CXL EXPLOSIVES

Our regular grades of explosives are practically non-freezing; and need not be thawed even in coldest weather.

We supply Blasting Accessories—Caps, Fuses, Wire, Batteries, Cap Crimpers, etc.

Canadian Explosives Limited

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District Offices

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Edmonton Calgary Nelson Victoria Vancouver Prince Rupert

Highway Engineers, Road Superintendents and Contractors!

Right NOW is the Time to Buy Your Equipment for This Season's Work!

In another few weeks there will be a scramble for Road Making Equipment and Material Deliveries on New Contracts. This can only result in Higher Prices, Longer Deliveries and Disappointments in Shipment, so—

DON'T DELAY ANOTHER DAY

We have in stock for very prompt shipment, the following road making equipment:

Marion Model 21, full revolving caterpillar traction **Steam Shovel,** ¾ yard dipper.
Marion Model 30, full revolving **Steam Shovel,** on standard gauge railway wheels, ¾ yard dipper.
5-Ton, revolving **Whirley Crane** for ¾ yard clam, 42 ft. boom, self propelling, standard gauge.
15-Ton Saddle Tank **Locomotive,** standard gauge, Porter, 9 x 14 cylinders, 32" drivers.
11—Contractors **Dump Cars,** "Western", 4 yard capacity, 36" gauge, all overhauled.
New 2 yard **Clam Shell Bucket;** 1 overhauled ¾ yard clam shell.
Used 1 yard Iverson **Dragline Bucket;** 1 Haywaard Orange Peel Bucket, 2 ft.
8¼" x 10" double cylinder, double drum **Hoisting Engine** with boiler and swinger.
6½" x 12" Mundy 3 drum **Hoisting Engine** for clam shell work with swinger.
7 x 10 double drum **Hoist** suitable for dragline, can arrange steam or other power.
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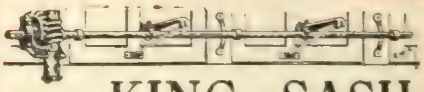

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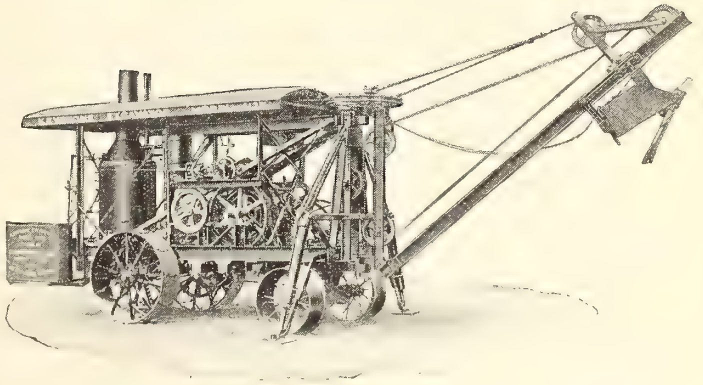

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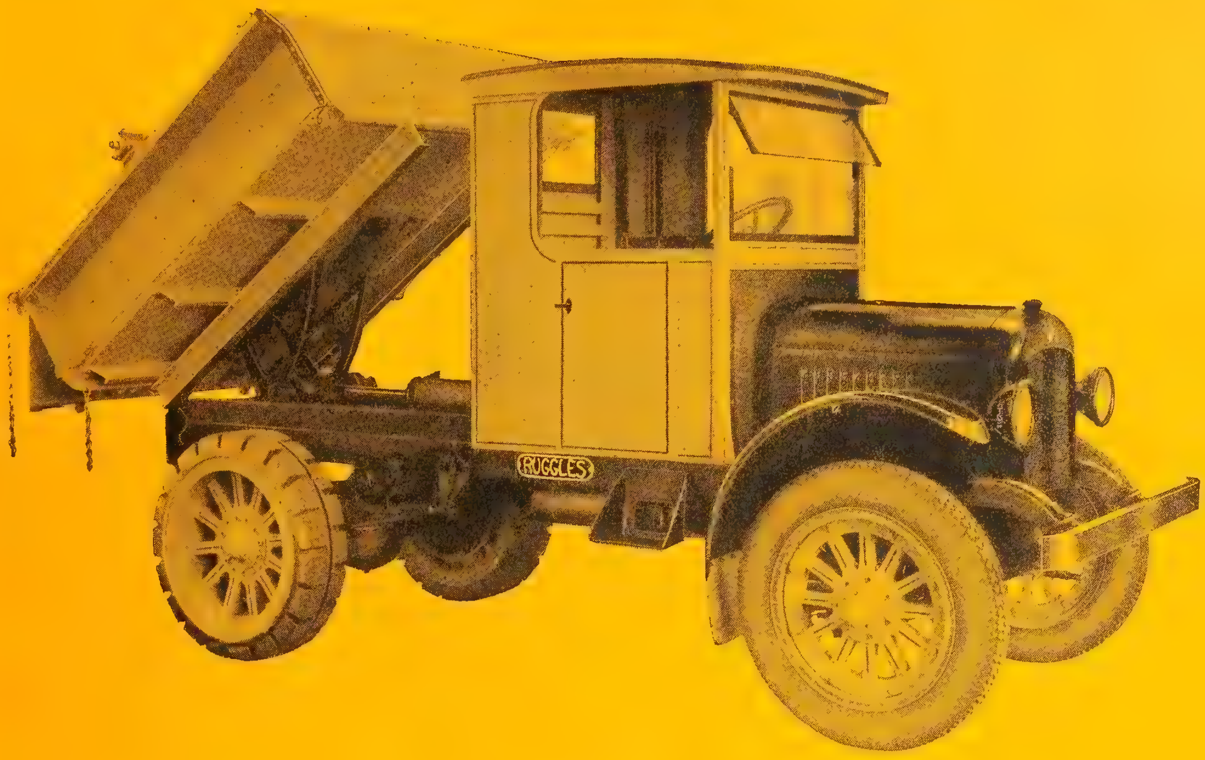

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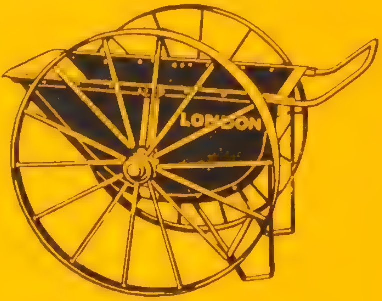

Fig. 83
London Concrete Cart No. 6

Fig. 83 illustrates the London Concrete Cart No. 6. Built for hard usage. The load is correctly balanced. No weight on the operator's arms. Dumps easy and clean. Described in Bulletin O.

Fig. 808 illustrates London Concrete Mixer No. 4A mounted on automobile springs with large wood wheels or automobile wheels as preferred. May be hitched behind a truck and will travel over rough roads at 15 miles per hour. Especially suitable for repair work. Described in Bulletin 49 C 1.

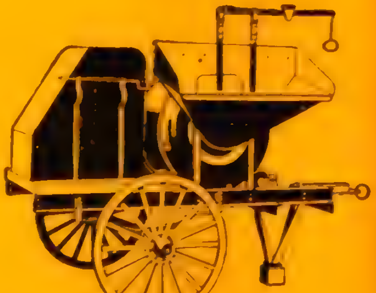

Fig. 808
London Concrete Mixer No. 4A

Fig. 47 illustrates London Paving Mixer with Elevated Drum and Rotary Delivery Chute. Made in two sizes, Nos. 11 and 16. Described in Bulletin 49 K.

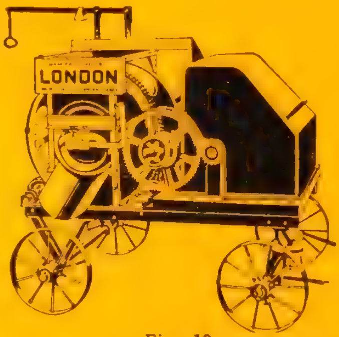

Fig. 19
London Concrete Mixers Nos. 4, 6

Fig. 19 illustrates London Builders' Mixers, Nos. 4 and 6. Suitable for foundations, floors, bridges or work not requiring over 60 cu. yards per day. Described in Bulletin 49 D.

Fig. 801 illustrates London Traction Sidewalk Mixer. Travels along on the street under its own power and deposits the concrete on the sidewalk while moving. Capacity 120 cu. yards per day. Described in Bulletin 49 L.

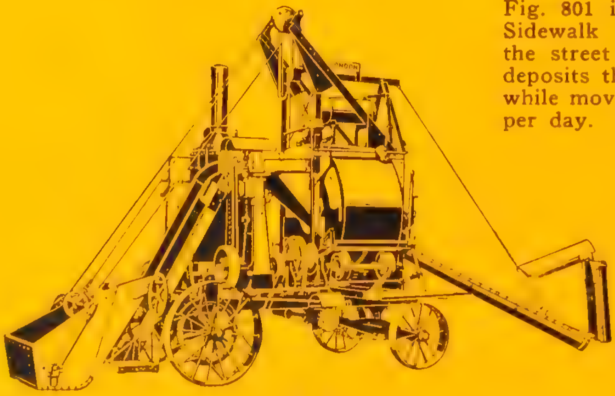

Fig. 47
London Paving Mixer with Rotary Chute

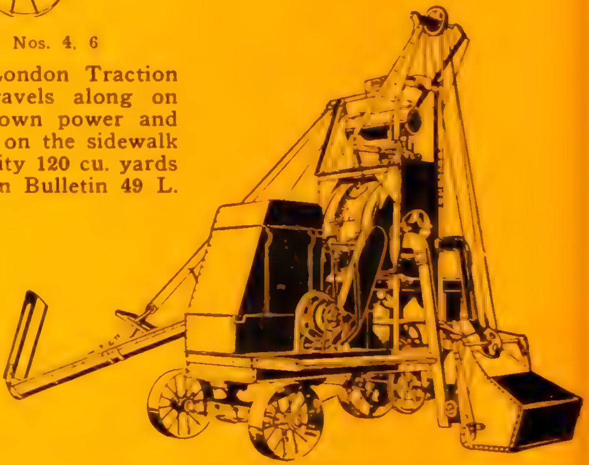

Fig. 801
London Elevated Drum Sidewalk Mixer

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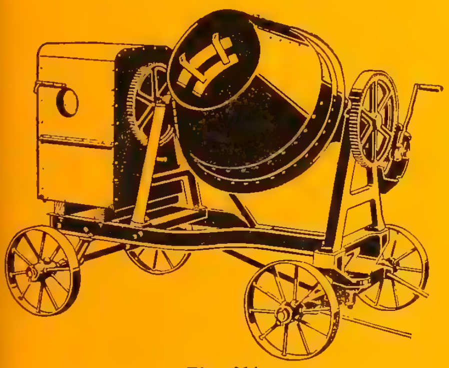

Fig. 814
London Gem Concrete Mixers Nos. 3 and 5

Fig. 814 illustrates London Gem Concrete Mixers, Nos. 3 and 5. Suitable for foundations and other small contract work requiring from 25 to 50 cu. yards per day. Described in Bulletin A-3.

Fig. 33 illustrates London Heavy Duty Builders' Mixers with Gasoline Engine. Made in five sizes, 50 to 300 cu. yards per day. Described in Bulltein 49 D 2.

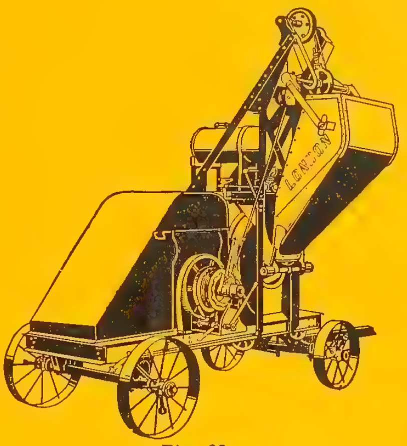

Fig. 33
London Heavy Duty Mixers with Gasoline Engine

Fig. 39 illustrates London Heavy Duty Builders' Mixers with Steam Engine and Boiler. Made in five sizes, 50 to 300 cu. yards per day. Described in Bulletin 49 D 2.

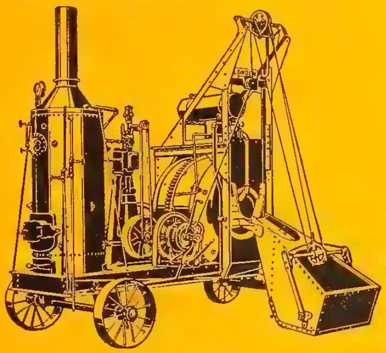

Fig. 39
London Heavy Duty Mixers with Steam Engine and Boiler

Fig. 90 illustrates the London Paving Mixer No. 16 B with Boom and Bucket, Steam Driven. This machine is also made with full caterpillar drive. Described in Bulletin 49 K B.

Fig. 25 illustrates the London Combination Mixers, Nos. 4 and 6. A Concrete Mixer with a real Builders' Hoisting Drum attached. Two machines in one. Largely used for excavating and for contracting work requiring up to 60 cu. yards per day. Described in Bulletin 49 D 1.

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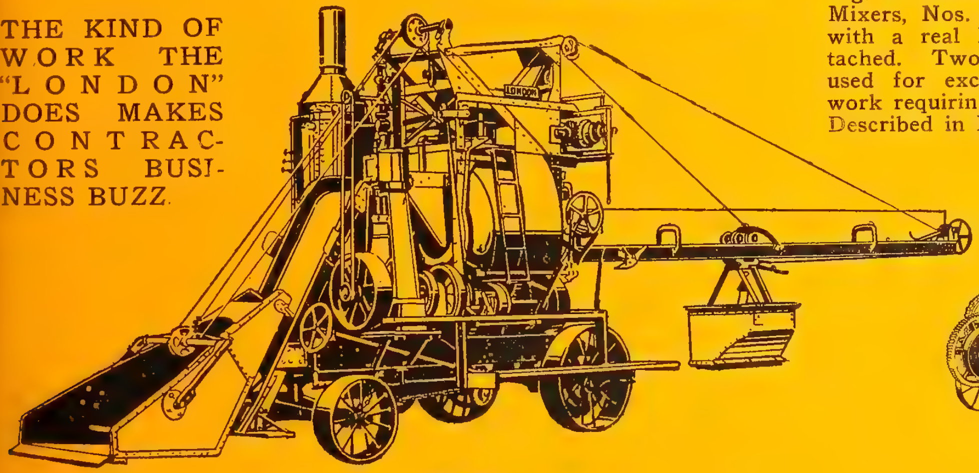

Fig. 90
London Paving Mixer No. 16B with Boom and Bucket

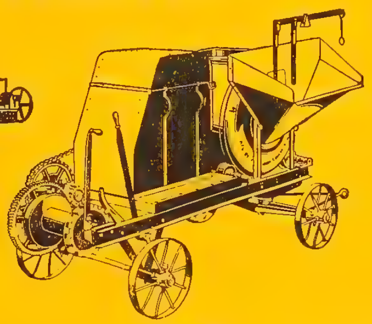

Fig. 25
London Combination Mixers Nos. 4 and 6

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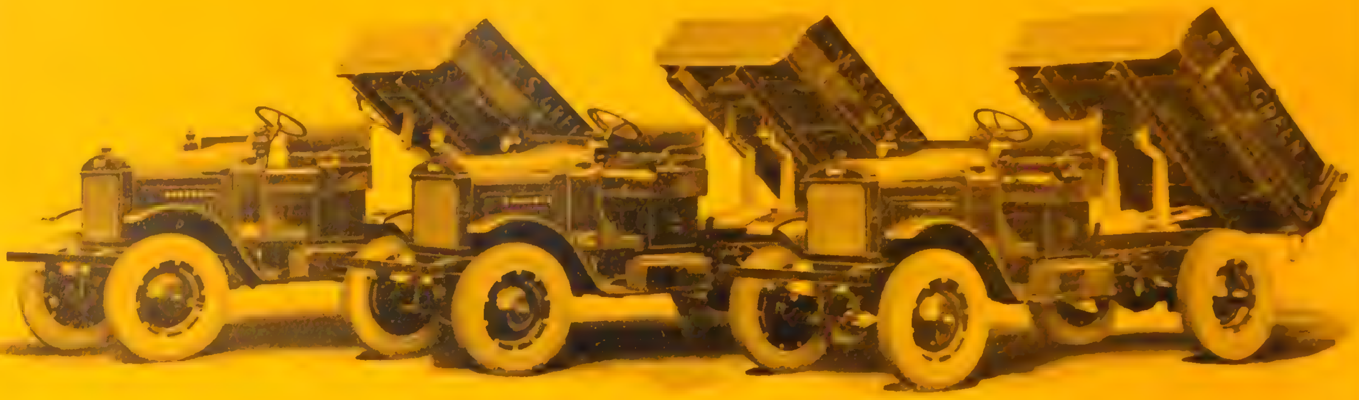

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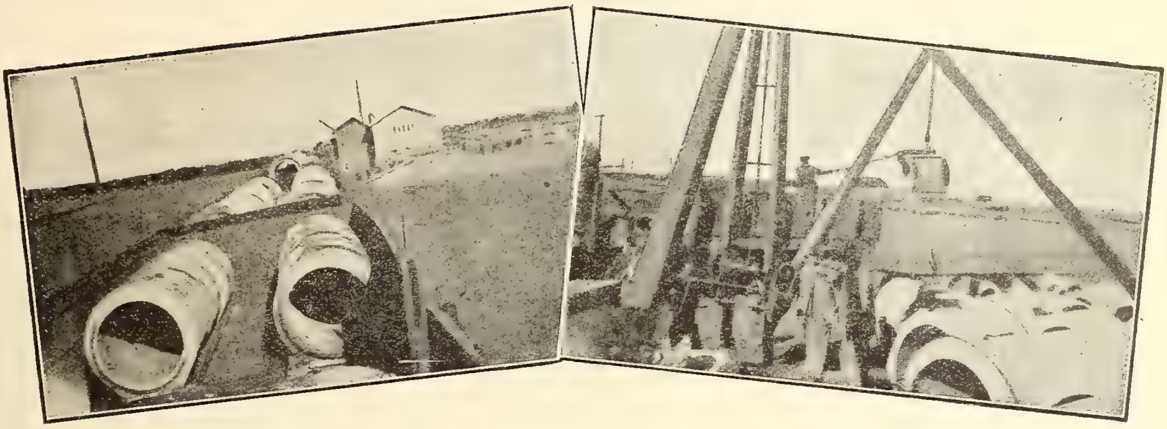

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Gypsum Products are not a substitute for other building materials. They are infinitely better and more economical in every way. The advantages they offer are recognized and lauded by building experts, fire chiefs, underwriters, and home owners.

There is no comparison for instance between wood lath and Gypsum Board. The former is but a flimsy excuse, unsanitary and dangerous—a primitive make-shift. But consider Gypsum Board—it's modern! efficient! safe! Solid as a rock; doesn't warp, bulge or crack. It symbolizes permanency, comfort, protection.

So with the other Gypsum Products. They are the direct result of a demand for better building materials. In selling them you are rendering your trade a distinct service, and establishing good will and better profits for yourself.

Write us today for full particulars.

THE ONTARIO GYPSUM COMPANY LIMITED
Head Office: PARIS, ONT.
Toronto: 106 Don Esplanade Montreal: 374 Beaver Hall Square
Factories: Caledonia, Ont. Lythmore, Ont.

PUDLO

Brand Powder

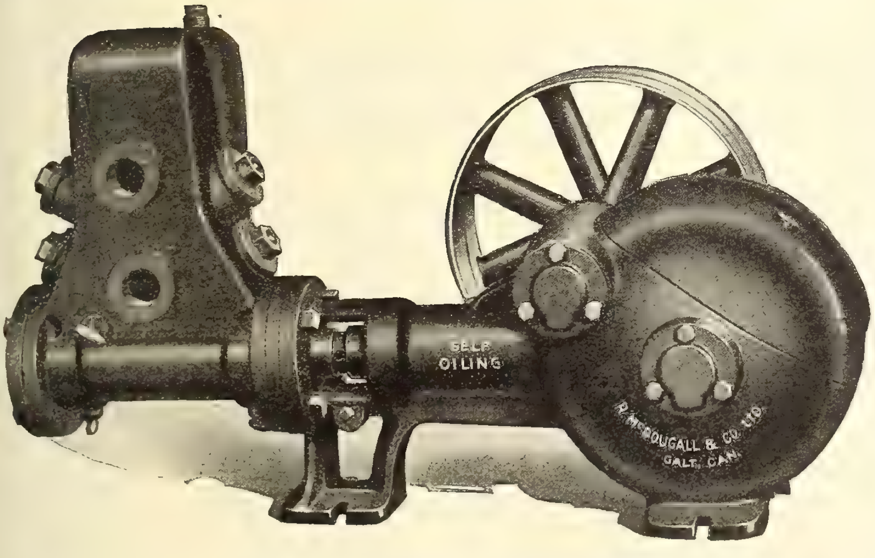
Makes Cement and Concrete Waterproof

Dread of flooding, with the resultant expense and worry, is removed from the mind of the Contractor who has used the great waterproofer—PUDLO—in his cement and concrete work. No water has ever entered a structure where our PUDLO Specifications have been followed.

Use for basements, cellars, reservoirs, tanks, renderings, stucco, dampcourses, sewers, stokeholes, boilerpits, roofs, preventing efflorescence in cement, mortar, etc.

Spielman Agencies Reg'd. **45 St. Alexander St., Montreal**

Ottawa..........J. W. Anderson, Bank St. Chambers
Toronto.........C. W. Beal, 60½ Adelaide E.
Sault Ste Marie..N. G. Dehaas, 651 Queen St.
London.........E. R. Seabrook & Co., 119 King St.
Quebec........Pruneau & Co., 149 St. Pierre St.
Halifax........R. R. Power, 311 Royal Bank Bldg.
St. John, N.B..T. McAvity, & Sons Ltd.
Winnipeg, Edmonton, Saskatoon, Calgary..............Winnipeg Paint and Glass Co.



McDougall Pumps are built to give real service under all conditions.

Wherever a pump is required to be on the job day in and day out, delivering its maximum capacity without any attention, McDougall Self-Oiling Power Pumps are in a class by themselves.

They are made in sizes ranging in capacity from 500 to 3,000 gallons per hour and are adaptable for Electric Motor or Gas Engine Power.

Descriptive Bulletins and prices gladly furnished on request.

Here is an unsolicited expression of opinion from a large firm of Road Contractors who used one of these pumps for supplying water to a Cement Mixer on the new Concrete Highway out of Guelph.

The Pump mentioned was a McDougall Self Oil Bulldozer with a capacity of 1,000 gallons per hour.

"The R. McDougall Co. Ltd.,
Galt, Ont.

Dear Sirs:

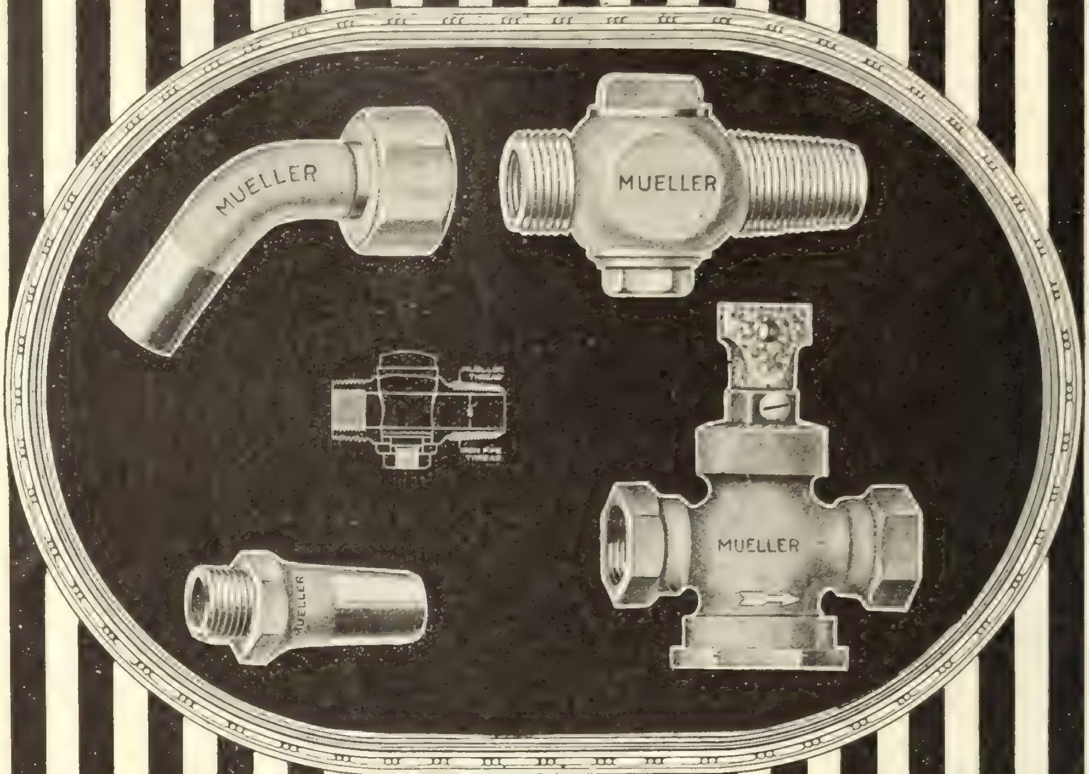
You can cancel our order for the larger pump and bill us for the one we have.

The pump we have is a little wonder. We have been getting 70 lbs. pressure at one mile and a half through inch and a half pipe which more than supplies our water demand."

Manufactured in Canada by

The R. McDougall Company Limited

GALT - ONTARIO



Why Public Works Endorse Mueller Goods

For three generations *MUELLER* Brass Goods have set the standard for efficiency, for economy, and for progressiveness.

The *MUELLER* Thread—now standard practice on Corporation Cocks—is but one example of these vital principles. This simple device adds to strength of Cock at point of contact with pipe—makes a tighter joint—saves breakage—and thus reduces overhead.

MUELLER makes Brass Goods for Public Works of all kinds — Corporation Cocks (A-201) — Soldering Nipples (A-262)—and Ground Key Curb Cocks (A-570)—each with special features found only in *MUELLER* Products.

Ask any Public Works Company about
MUELLER—or write to MUELLER direct.

H. MUELLER MFG. CO., LIMITED, SARNIA, ONT.

Water, Plumbing and Gas Brass Goods and Tools.

American Factory at Decatur, Ill., U. S. A. Branches, New York and San Francisco

Mueller Metals Co., Port Huron, Mich., Makers of "Red Tip" Brass Rod; Brass and Copper Tubing; Forgings and Castings in Brass, Bronze and Aluminum; Die Castings in White Metal and Aluminum; also Screw Machined Products.

Always Good—
Now Better than Ever

The Complete
FEDERAL
Line

FOR 12 years Federal trucks have been giving dependable service at remarkably low cost. They have built the Federal reputation, a nation wide organization, and a company that is one of the soundest financially.

The Federal line has always been good but now it is better and more complete than ever. Ask Federal Distributors why.

FAST EXPRESS

A sturdy, fast, economical, light duty truck.

1 to 1½ TONS

With pneumatics for fast service or with solid tires.

2½ TON

Users say it is the best 2½ tonner built.

3½ to 4 TONS

With stamina and an abundance of power for hard jobs.

5 to 6 TONS

For power, unsurpassed by any size or capacity truck anywhere.

LIGHT DUTY TRACTOR

It has exceptionally short turning radius and ample power.

HEAVY DUTY TRACTOR

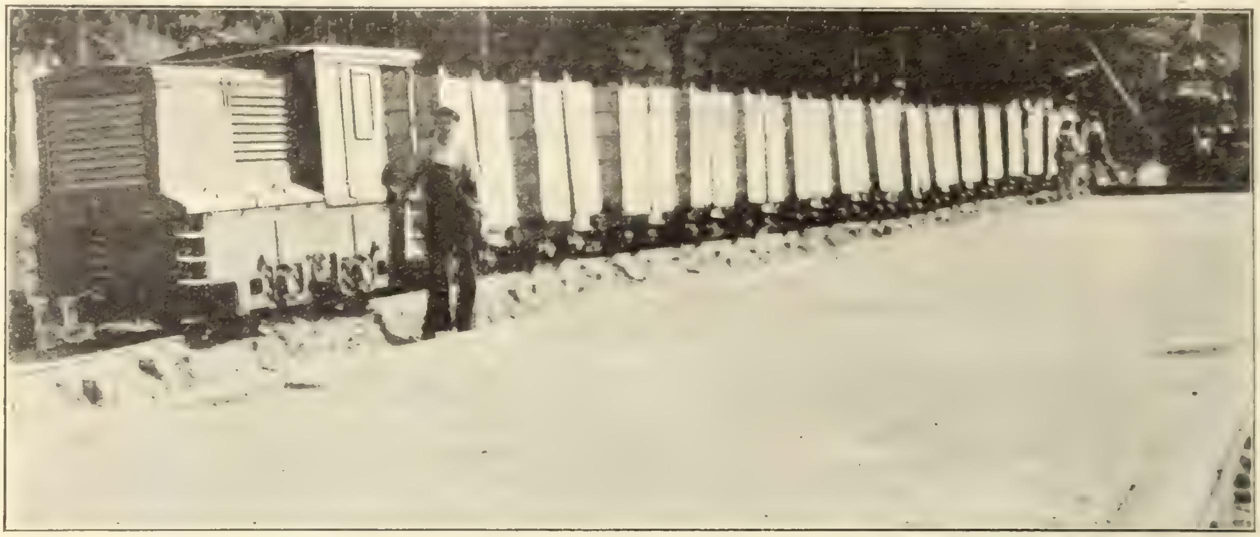
For heavier loads than the Federal Light Duty.

Federal Motor Truck Company
Detroit, Michigan

Another
FEDERAL
Means Another Satisfied User

Jones Motors Ltd.

291 King St. W. **Phone Adelaide 39**
Toronto — Ontario



One of the four 6-ton Plymouth Locomotives owned by West Construction Co., Chattanoogoa, Tenn.

Building 100 Miles of Hard Surface Roads

This is a very sizable contract and is reported by the West Construction Co., of Chattanooga, Tenn., from their branch office at Kinston, N.C.

Yet we understand this contract is but a part of her great highway system which the south is building for the good and convenience of her people and for the pleasure of tourists who make Southern Winters full of life and profit. As usual the Plymouth Gasoline Locomotive is assuming the haulage burden. If you are interested in haulage, what the West Construction Co., says in the adjoining panel is as interesting to you as it is to us.

West Construction Co.,
Kinston, N.C.
The Fate-Root-Heath Co.
Plymouth, Ohio

Gentlemen:

We have four 6-ton Plymouth Locomotives in service on 100 miles of hard surface road in the Eastern District of North Carolina.

Industrial Railway Transportation of road materials for concrete in this section of North Carolina is unquestionably the cheapest and most satisfactory.

Plymouths are the most satisfactory and economical gasoline-operated equipment of any kind we have ever owned.

The West Construction Company,
By L. B. West, President,

F. H. HOPKINS & CO., LTD.
Montreal - Quebec

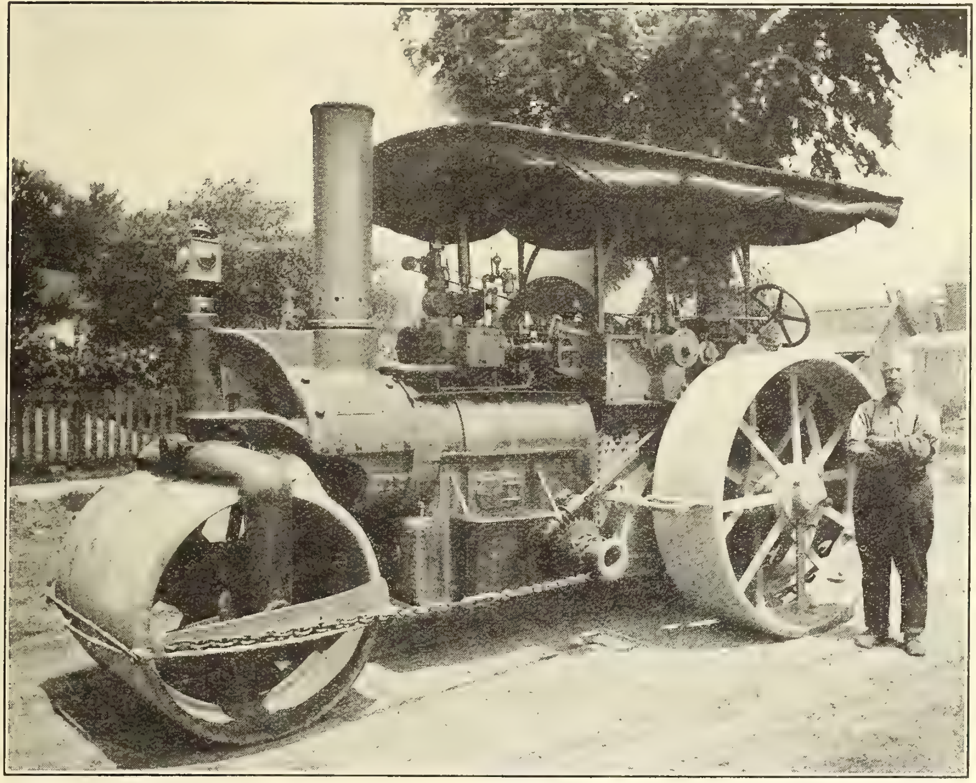
BROWN, FRASER & CO.
Vancouver, B. C.

District Representatives :

The Fate-Root-Heath Co., Plymouth, Ohio

PLYMOUTH

Gasoline Locomotives



Worked Steadily for 22 Years and Only $200 Spent for Repairs

The value of long life and low upkeep costs is the most important consideration in the choosing of a road roller, for when the roller is laid up for repairs your whole road gang must quit work. Time out for repairs is a handicap Waterous roller users seldom experience.

Hundreds of users have found unusual service in Waterous Rollers, as the paragraphs show:

"We have a Road Roller purchased some **22** years ago and Mr. E. Plummerfelt has been engineer in charge of same since its purchase. The roller has never been sent to the repair shop. A few wearing parts have been replaced and two or three patches on the boiler plates have been made, but the total repairs since its purchase would not aggregrate more than **$200.00**. The Roller has proven an excellent machine."

"The Waterous Roller which we own has given entire satisfaction. The roller had seen considerable service at the time that we purchased it and we have now used it for two seasons with a total expenditure for repairs of **$54.00**. Early this year we equipped this machine with a Buffalo-Springfield Pressure Scarifier. This has more than doubled the utility of the roller."

"Our road roller has been in operation practically continuously since it was bought in **1911** and with only a minimum amount of repairs has given good satisfaction during that period. The approximate expenditure on repairs and renewals to date has been about **$400.00**. One feature that has been most pleasing to us is the fact that the wheels both front and rear show practically no wear at all notwithstanding the hard work to which it has been subjected."

"In reply to your favor of the 6th inst., in regard to the **10** ton Steam Road Roller purchased from you in **1906**. We wish to say that the roller is still going strong and in addition to the work on the Town roads last season it was used on the County roads and in other Municipalities in this vicinity and was in commission working steadily for the greater part of the working season. Owing to some of the castings having become much worn they were replaced last year at a cost, for castings, labor replacing and general repair of **$228.29**. In other years the cost for repairs has been about **$50.00** per year. We expect to have many years service from the roller and there has been no thought of replacing it."

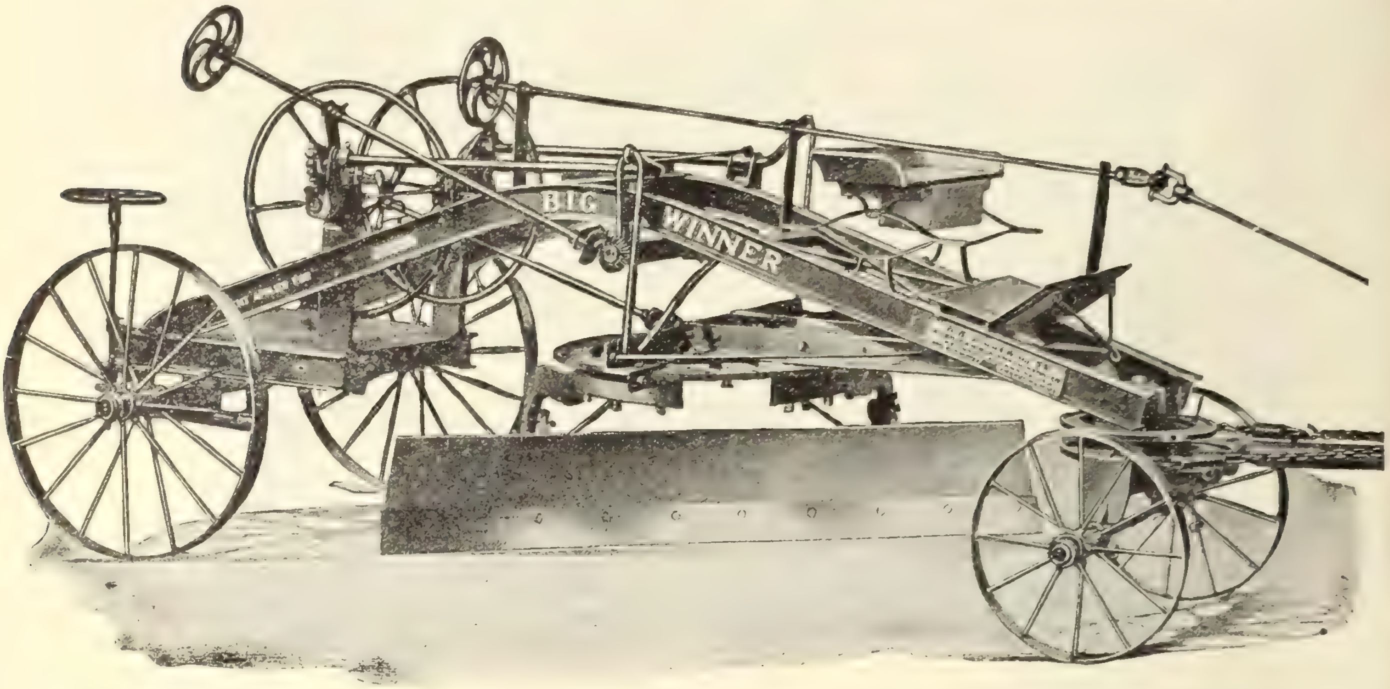
MOLSON'S BANK BLDG., VANCOUVER, B.C.

WINNIPEG, MANITOBA

Waterous

BRANTFORD, ONTARIO, CANADA

Champion for Dependability



The Champion Big Winner

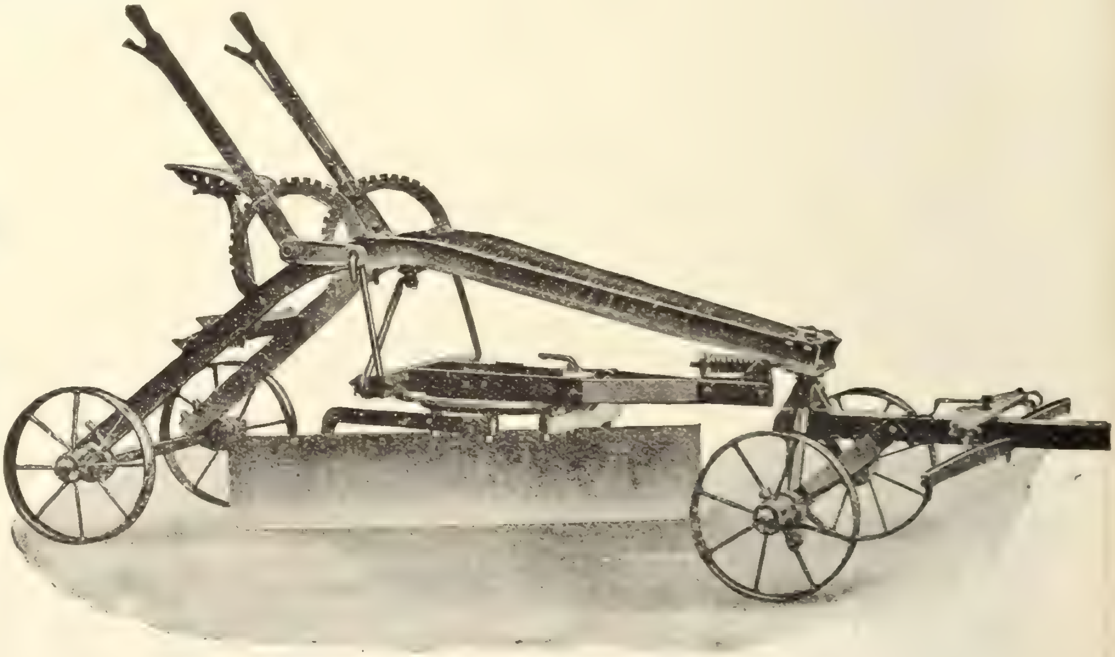
Weight with engine pole 4000 lbs.
Reversible blade 8 ft. long, rear axle side shift and angle adjustment. The last word in modern grader efficiency.

Champion BABY WINNER

Weight 760 lbs.

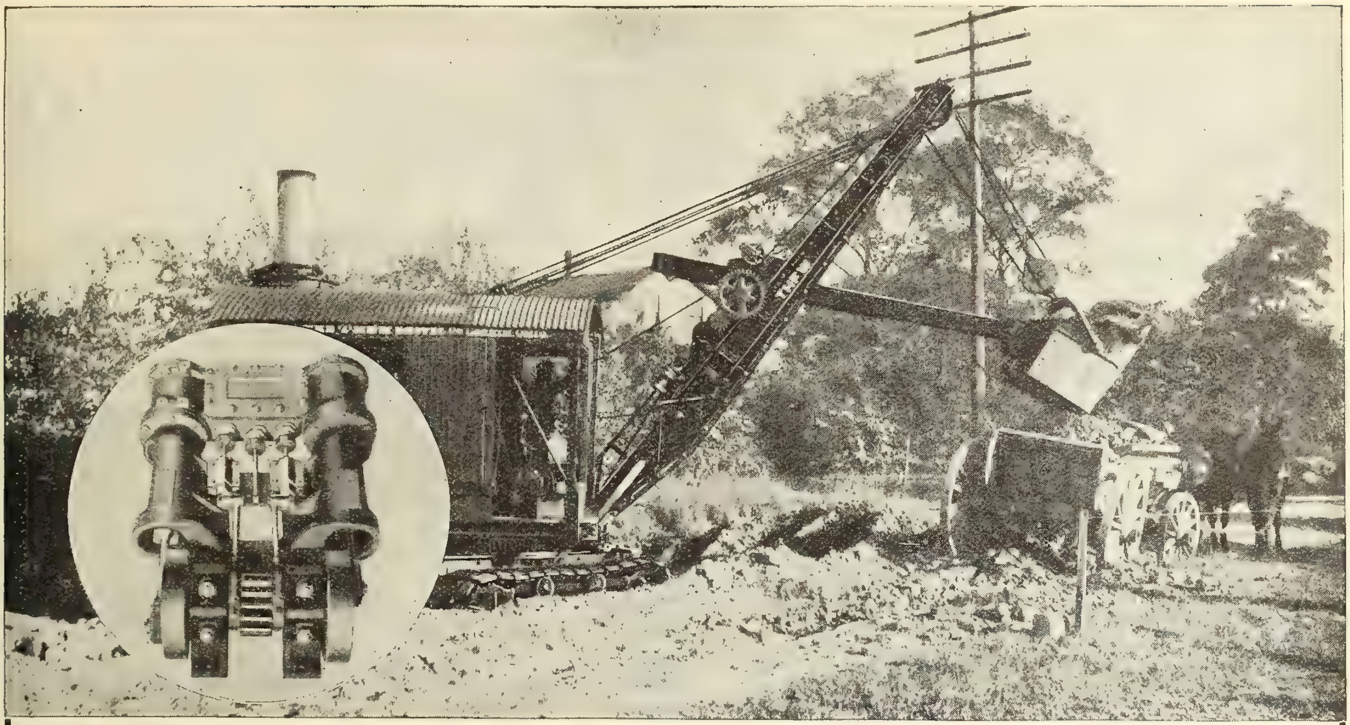
Length of blade 5 ft.

Designed for quick action, rugged service and small upkeep.



The Dominion Road Machinery Company Limited

Goderich - Ontario



Backing the Business End

The business end must have something behind it.

It should be backed by engines that have reserve power, that run smoothly, and that are economical of steam. They should be simple in design, easy of adjustment, readily accessible and above all economical in upkeep.

Most every shovel runner knows Thew engines and has little to say against them. Thew was the pioneer in the small shovel game and has spent twenty-seven years making engines for shovels.

The result is a two cylinder, horizontal engine that's down flat on the turntable and boom. Its position eliminates destructive vibration.

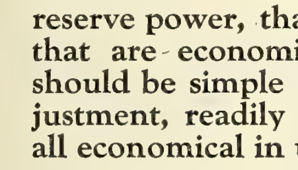
All engines on the Thew are perfectly accessible and the bearings, stems, guides and valves are easily and quickly adjusted. Pinions are between over sized bearings. The steam chest with one cover contains all valves. The seats are marked for setting. These are reasons why Thew engines wear longer.

The Thew engine has a throttle reverse which means that there are few moving parts. It is simple in design and efficient in operation. Of course the turntable engines are covered with a hinged steel platform. This provision allows operator and fireman to walk over them at will.

Don't forget that the engine is the heart of your shovel and that it must be backed up. This month we are mailing the second of an interesting series on shovel construction. This covers turntable details. Just ask for 223.

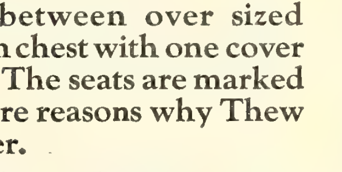
THE THEW SHOVEL COMPANY, LORAIN, OHIO

ALLIED MACHINERY COMPANY OF AMERICA



Thew

Power Shovels



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Stock of Paving Blocks always on hand ready for immediate shipment

PARIS SAND & GRAVEL COMPANY

Washed Concrete Sand
Dry Screened Concrete Sand
1″ Washed Screened Gravel
2″ Washed Screened Gravel

We make a speciality of Pit Run Gravel, in fact we can give you what you want.

Capacity 30 cars per day.

RURAL ROUTE No. 2
PARIS, ONT.

Largest and Best Equipped Plant in Ontario

As evidence of our desire to give customers the highest grade product and the best service, we have installed the most modern equipment known to the industry.

A daily output of 3500 tons is being achieved and the stone, all sizes, comes clean and even in size.

Write, wire or phone your orders for quick action

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Plant at St. Vincent de Paul, P. Q., on River des Prairies, opposite Montreal

Largest Plant in CANADA and the most up-to-date in the World

CAPACITY 4000 TONS A DAY

All Sizes and Grades of the Best Hard Lime Crushed Stone Produced

MAIN OFFICE: 590 Union Avenue MONTREAL, P. Q.

You believe

In the use of ***Canadian Materials***

Queenston Blue Dolomite

A Canadian Stone
of
Superior Quality and Color

Will not Stain
Retains its Bright, Clean Appearance

Ashlar, Dimension Blocks, Sawn Slabs, Sawn Dimension and Cut Stone.

Estimates cheerfully furnished
Send for samples and prices

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Why You Can Be Sure of Delivery of

SAND LIME BRICK

Contractors and architects who order from us do so with the knowledge that their order will be filled on time. We guarantee this service by keeping a reserve stock constantly on hand and will not accept orders that will deplete this reserve. This means that you get delivery when you want it.

Quality—the finest ***Prices—right***

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LARGEST PRODUCERS OF LIME IN CANADA

PLANTS

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LIME
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SAND
ST. FELIX DE VALOIS, QUE.
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Better Stone for Better Roads

HAGERSVILLE

CRUSHED

BLUE STONE

Capacity 1,000 tons daily

For the Satisfaction of our customers who truck stone from our plant we are installing a scale.

Stone delivered on G.T.R., M.C.R., C.P.R., T.H.& B., P.M., N. St. C. & T., L. E. & N., L. & P. S., and C.W. & L.E. Railways.

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COMPANY, LIMITED

Office and Quarries - Hagersville, Ont.

Phone: Days 23, Nights and Sundays 33

W. H. LINDSAY, Secy., Hagersville, Ont.

When You Are in Need of

CRUSHED STONE

for

GOOD ROADS

Largest and Best Equipped Plant in the Famous Hagersville District

We Can Make Prompt Delivery on All Steam and Electric Roads

THE HAGERSVILLE CRUSHED STONE CO.

HAGERSVILLE, ONT., PHONE 19

R. Hambleton, Manager

We specialize in

Docks
Canals
Harbours
Foundations
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Above illustration shows travelling derrick handling 18-ton concrete blocks for Western Breakwater, Toronto Harbor Improvement Contract

Roger Miller & Sons, Ltd.

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Portland Cement
"Pyramid Brand"

Super Cement
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WHITE SAND
For
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Try "SUPER CEMENT" and WHITE SAND for
That Stucco Job

Washed Sand and Gravel
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Roofing Gravel
Trap Rock

Rogers Supply Company Limited

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Use CANADIAN Plaster

BUT SPECIFY

"HAMMER" BRAND

Hard Wall Plaster
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Manufactured by

ALBERT MANUFACTURING CO.
HILLSBOROUGH, NEW BRUNSWICK

Our plasters have stood the test of time for over fifty years

Hydrated Lime **Banner Brand**

Manufactured from the Celebrated Guelph White Lime

High Calcium Lime for Chemical Purposes

Manufactured at Beachville

Crushed Stone, all Sizes

Crushing Plant at Beachville

Standard White Lime Co. Limited

Head Office: GUELPH **Plants: Guelph, Beachville St. Marys**

DO IT *BETTER* WITH LINK-BELT LABOR-AIDING MACHINERY

Link-Belt Products include:
Elevating and Conveying Machinery,
Locomotive Cranes,
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World's largest makers of Conveying and Power Transmission Chains.
Catalogs on request.

MAKE your labor more productive—increase the efficiency of your men by using Link-Belt material handling machinery.

The Link-Belt Crawler Crane, illustrated, "the machine that gives locomotive crane service where there are no tracks" has no superior for road work, excavating and material handling. It is an all-purpose crane, operated by one man. Lays its own bed in soft ground and readily climbs over rough places like a war-time tank. Write for specifications, catalog, etc. Also send for book No. 370, showing the standard line of Link-Belt Locomotive Cranes, and books on any other Link-Belt products in which you are interested.

CANADIAN LINK-BELT COMPANY LTD.

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For Concrete and Macadam Roads

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FROM THE

HAGERSVILLE
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All stone is good; some stone is better but HAGERSVILLE STONE is the BEST for Concrete or Macadam Roads.

To meet the growing demand for HAGERSVILLE STONE we have enlarged our crusher plant to more than double its previous capacity and are in a position to take care of a large commercial trade.

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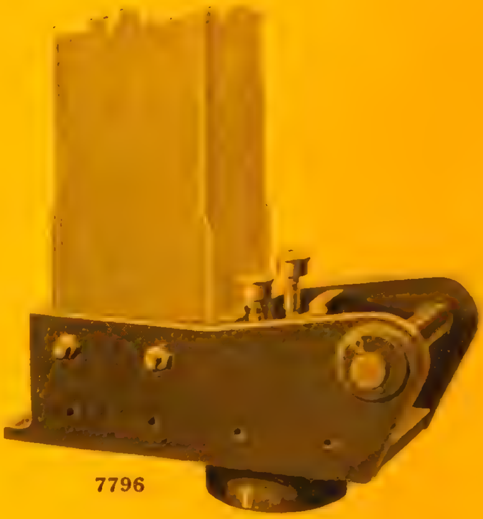
"MEAD-MORRISON"

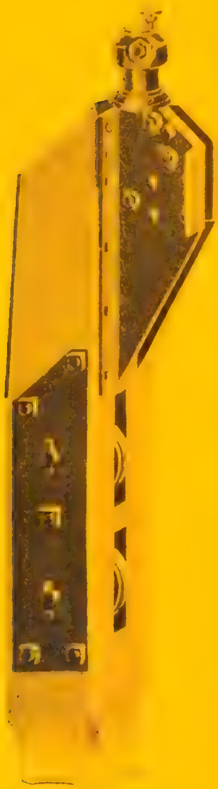
DERRICKS AND DERRICK IRONS

Mead-Morrison Derrick Fittings are of the latest, most approved type developed by engineering ability of the highest class after many years experience in design, manufacture and use of Contractors' Equipment.

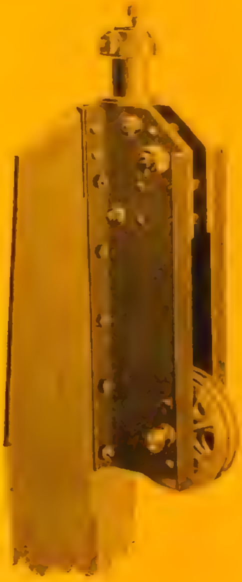


Mast and Boom Shoe

7796



Mast Top



Mast Top

Derrick Iron Pamphlet
sent on request

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Manufactured in Canada by

CANADIAN MEAD-MORRISON CO
LIMITED
CANADA CEMENT BUILDING
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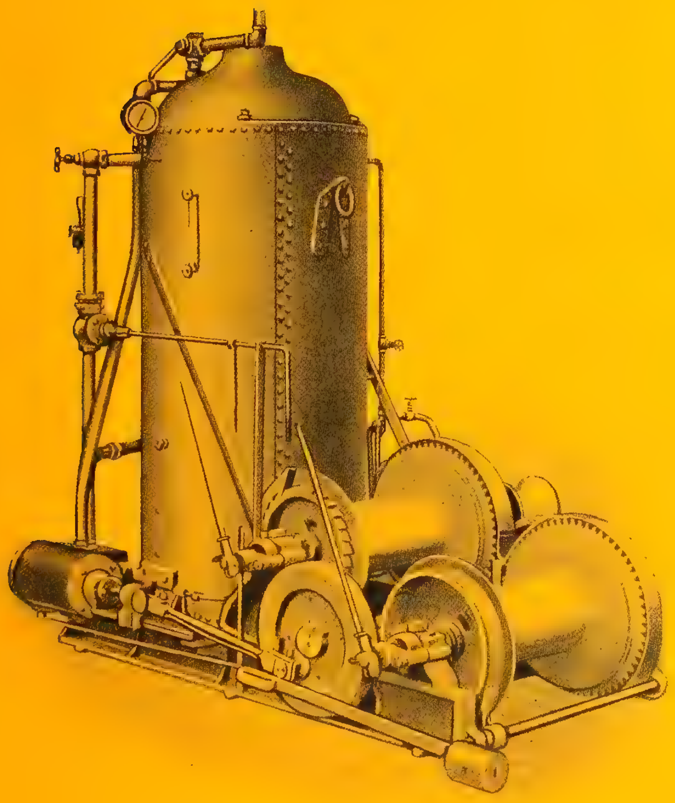
WORKS: WELLAND ONT.

"MEAD-MORRISON"

GRAB BUCKETS
HOISTING ENGINES



Beatty Double Drum Steam Hoist

Type "H" Grab Bucket
for hard excavating

Steam Hoists and Buckets of all sizes always in stock

MADE IN CANADA

Information and prices gladly furnished on request.

HARVARD TURNBULL & CO.
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TRAP ROCK

is Without an Equal for All Types of Highway Construction

because of its superior hardness, toughness and ability to resist wear.

Especially is it true economy to use it as the course aggregate in bituminous surface and in concrete pavement. Trap rock concrete pavement will wear twice as long as Limestone.

The additional cost of Trap Rock is saved many times over in the long life of the road and low maintenance charges.

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PACKARD DUMP TRUCKS STEAM SHOVELS CLAM SHELL CRANES

A feature exclusive of Rilett service by which the Road Contractor benefits is the systematic organization of modern equipment.

Our service looks after your

ROAD GRADING
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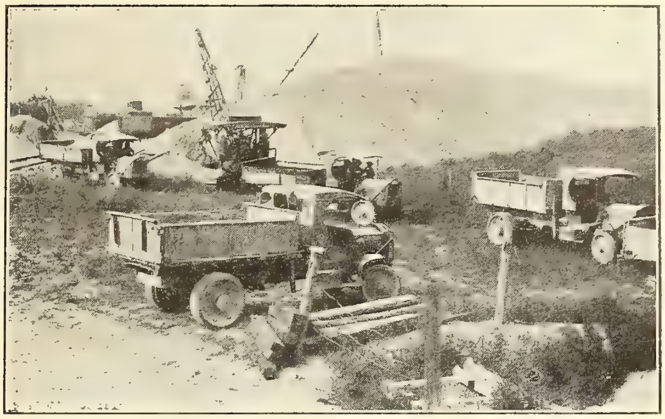
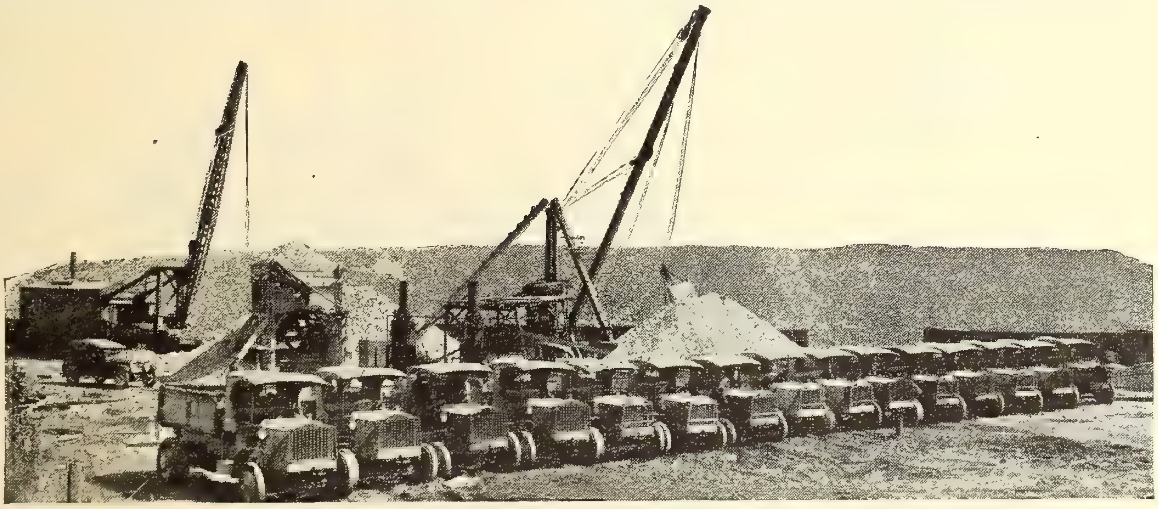
Why not get in touch with us?

WE CAN SAVE YOU MONEY



"How much expense and confusion can be avoided when transportation problems have been placed in our hands" was effectively demoustrated in our 1922 contracts. Some of the larger ones were:

Kingston Road near Dumbarton, Ont.
Kingston Road east of Toronto
Guelph, Ont. Road from Guelph to Elora.



At your service—Packard Dump Trucks, Steam Shovels and Cranes

RILETT BROTHERS

Excavation and Transportation Contractors

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Phone Main 3913 - - **Toronto, Ont.**

CASE
STEAM ROLLERS

Modern Road Machinery Can Do Much to Reduce Your Construction and Maintenance Costs

Reducing road building and maintenance costs to the minimum rests largely upon the efficiency of the machinery with which the work is done.

If you study the performance of CASE Road Building Machinery and compare it with similar equipment, you will inevitably reach this conclusion—"CASE outpoints all others in matters of efficiency, economy and long life."

In the most important competitive steam tractor tests held in America, CASE Steam Engines showed better economy both in belt and traction work than any other engines entered.

A larger volume of work can be accomplished every day because of the flexibility and continuous operation possible with this roller. The capacity of the fuel bunkers and water tank is sufficient to keep it going for a longer time without stopping for supplies.

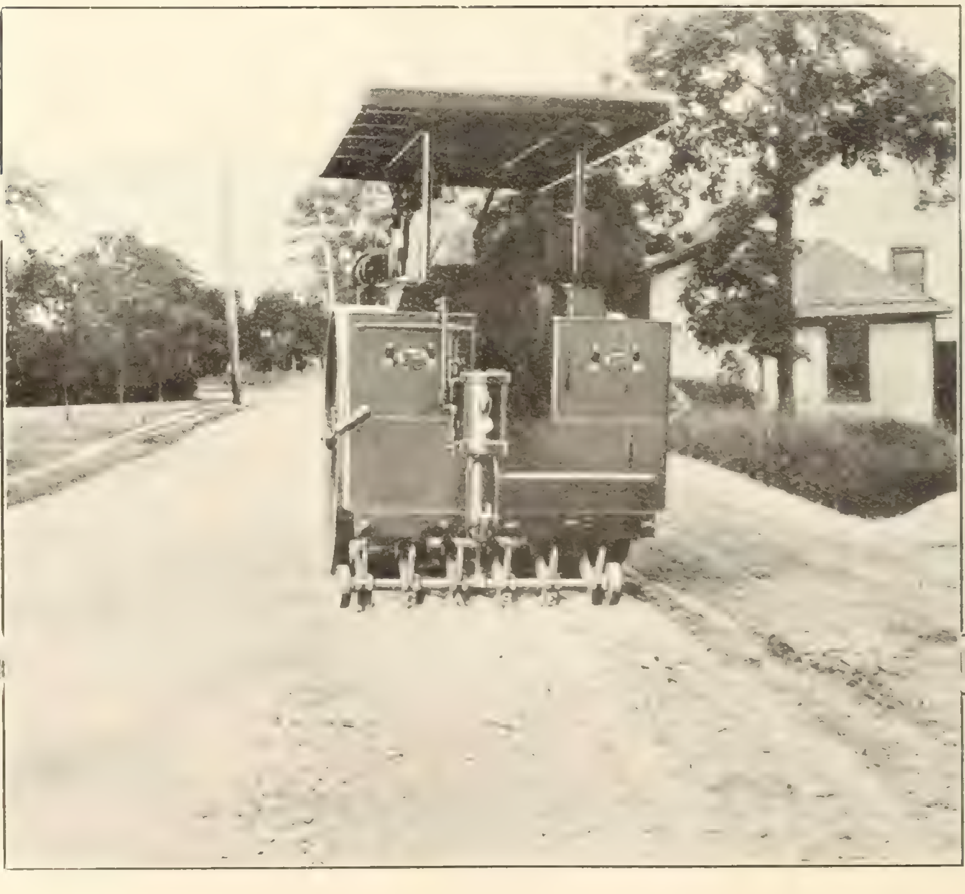
CASE Road Rollers are adaptable to all kinds of road work. As rollers, they consolidate the road material quickly and with exceptional uniformity. They operate rock crushers, concrete mixers and other belt machines economically. Converted into hauling tractors, they furnish efficient power for pulling road graders, scarifiers and other construction machinery; for hauling material or moving crushing plants and other equipment.

Case Road Building Machinery includes Road Rollers, Rock Crushers, Road Graders, Drags, Scrapers and Rooters. Ask us for illustrated catalogs

J. I. Case Threshing Machine Co. Toronto, Can.

Also at: Winnipeg Brandon Regina Saskatoon Calgary Edmonton

Some of the practical advantages of this equipment are:—The ample power of the roller to handle the scarifier, operating economy, ruggedness and dependability so essential to withstand the severe work often encountered, flexibility and easy control of outfit.



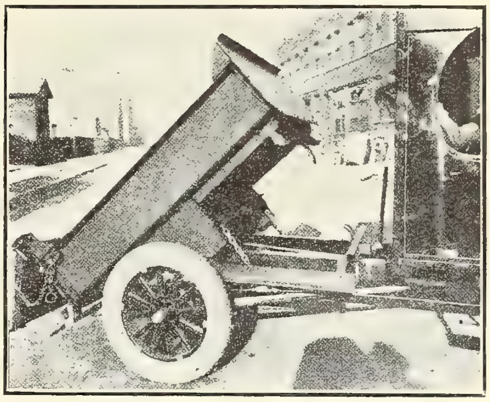
The scarifier is attached to the rear of the roller and the same operator handles both. The additional weight of the complete attachment is about 1850 pounds. A steam pressure cylinder is employed to raise and lower the teeth, which is under instant control of the operator, by manipulating a four way valve. The teeth are forced into the ground under a steam pressure of 4-tons and are held there by a steam cushion. The picks are quickly raised or lowered in passing over cross walks, manhole covers and other immovable obstacles.

DOMINION
TRUCK EQUIPMENT

Automatic Dump Body

COSTS LESS TO BUY — COSTS LESS TO MAINTAIN

Dominion bodies use no hoist. The action is automatic. Pulling one handle operates it from the driver's seat. They cost less to run because the weight is less, because there are fewer parts and because no power is needed. Dominion bodies are made to fit all types of trucks, including Fords. They are simple, sturdy and efficient. Let us furnish you with complete information and prices.



THE DOMINION TRUCK EQUIPMENT CO. LTD.

KITCHENER, ONT.

BATES SYSTEM

OF BAR TYING
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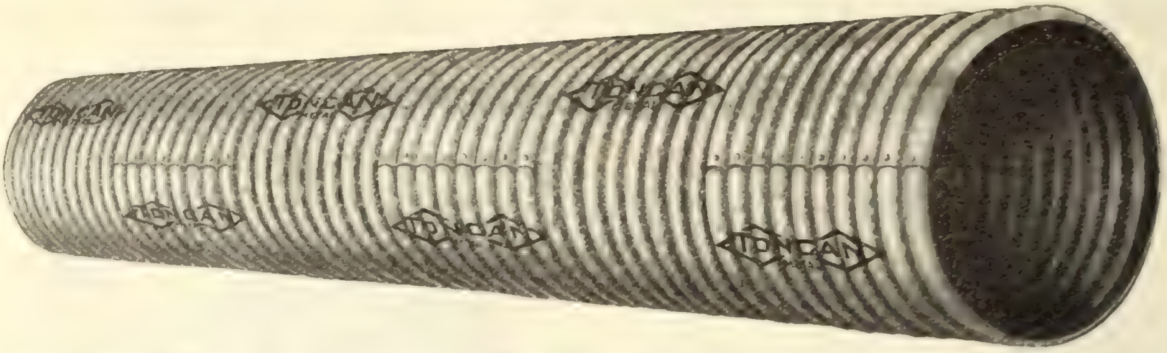

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With its high elastic limit is combined great unit strength.

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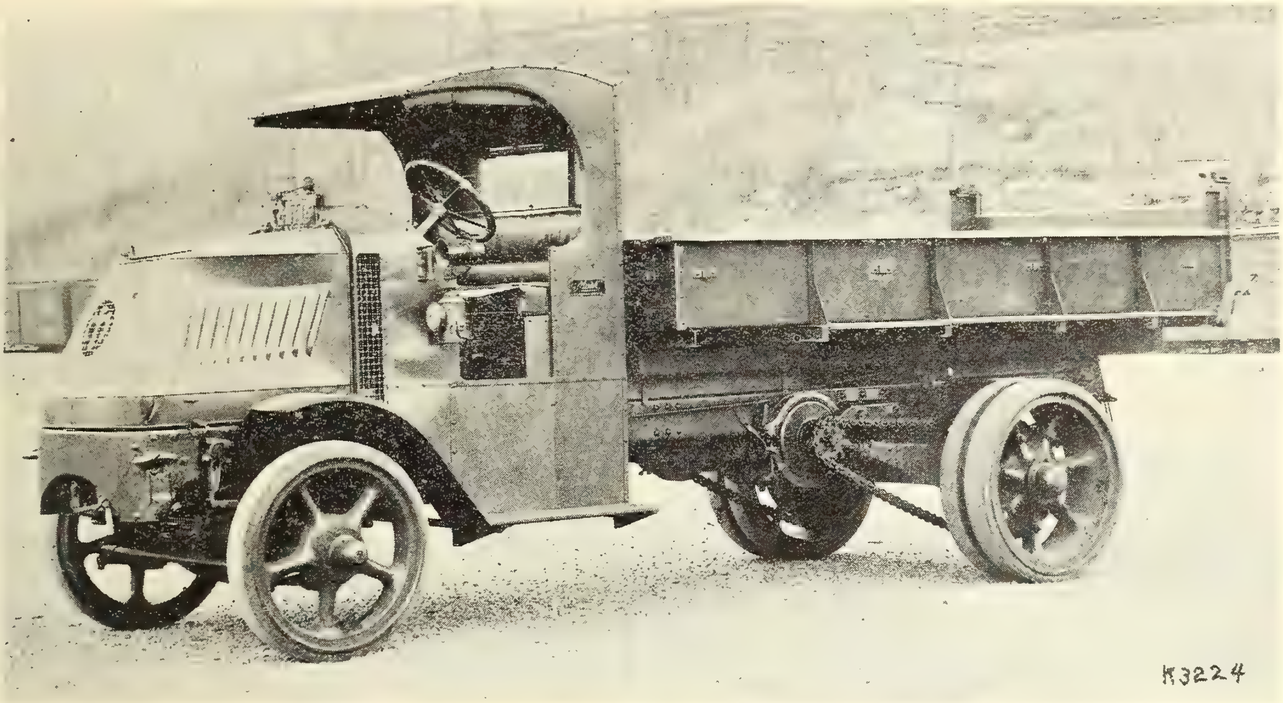

A REMINDER

While it is unnecessary to emphasize to the experienced contractor that the up-keep costs of roads develop in direct proportion to the quality of materials and workmanship put into them, it is not illogical to remind him that exactly the same relation of maintenance quality exists in the case of every piece of mechanical equipment he may possess, and a motor truck is no exception. Every owner of motorized equipment is only on an equal transport footing as his nearest competitor when his equipment is new.

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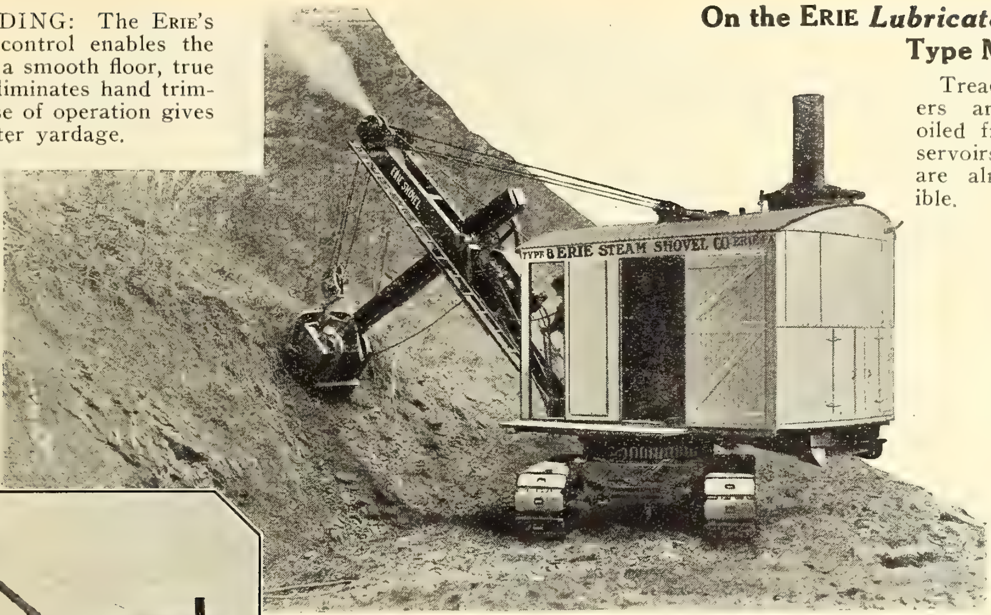

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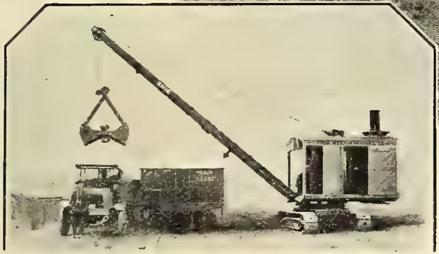
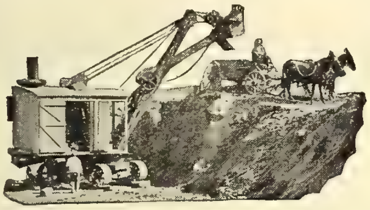


LOCOMOTIVE CRANE: Handling clamshell bucket for unloading cars of sand and stone, coal, gravel, etc., either direct to trucks, or to bins or storage piles. The ERIE also handles with dragline bucket.



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STEAM HOE: Works always on solid ground; the best machine for digging trenches in crumbly materials that would cave in with a shovel traveling over the excavated trench.

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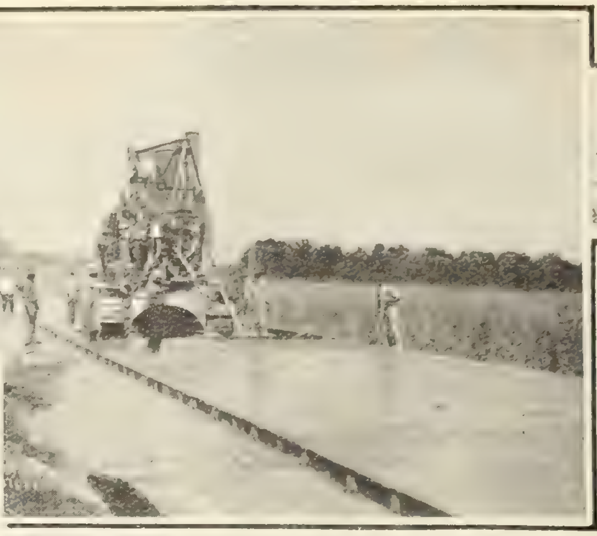

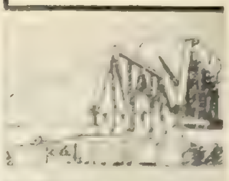

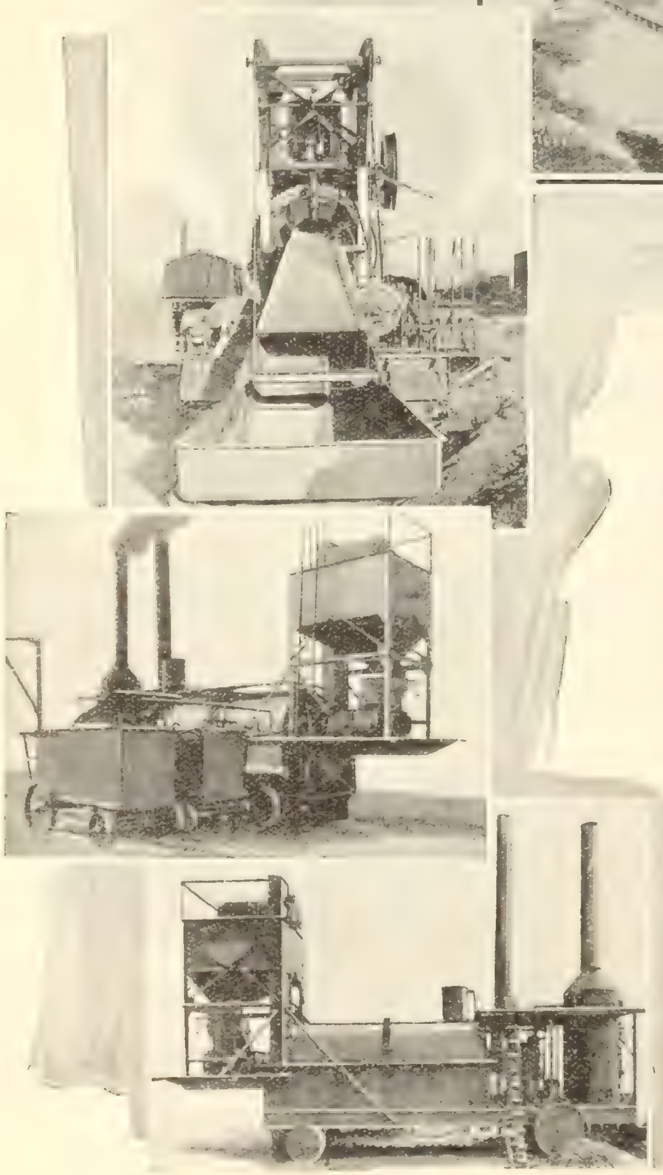

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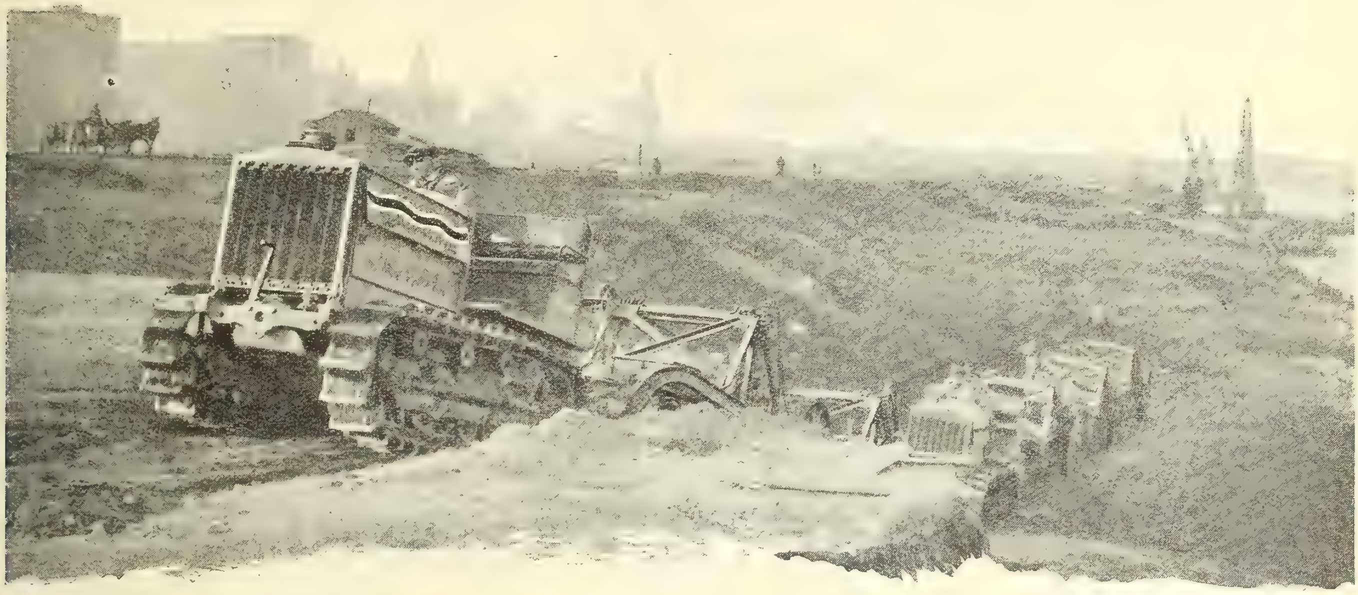

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The "Caterpillar's" field of usefulness is by no means limited to road work. There is a "Caterpillar"* of size and capacity for every power need. On farm or ranch, in the mining, oil and lumber industries, for snow removal and other civic work—wherever tractive power and endurance are at a premium, the "Caterpillar" has no real Competitor.*

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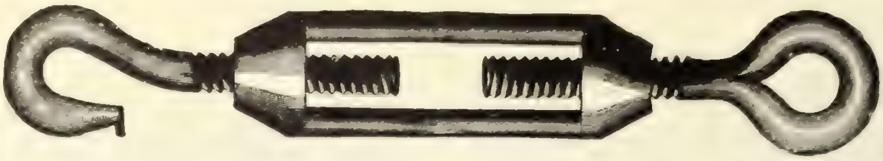

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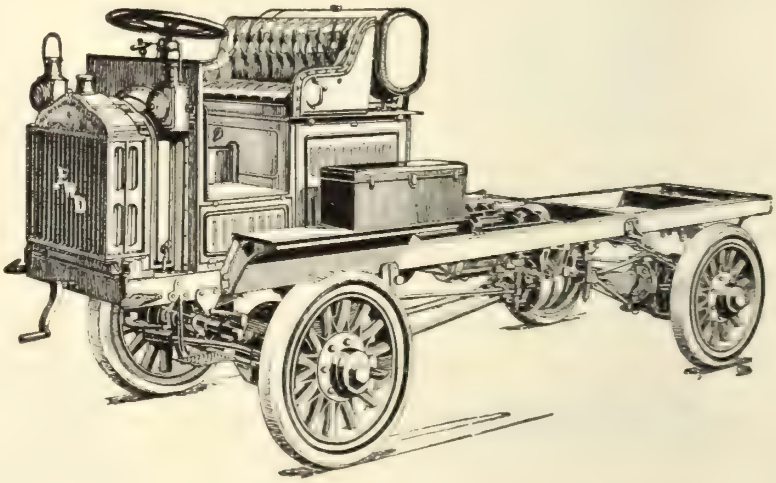

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If so, your salvation lies in Domtar—the quick and economical road building material that has stood the test of time and traffic. Endorsed by municipal engineers and road building contractors throughout Canada. Don't say you haven't the money to spend on roads this year until you have investigated Domtar prices.

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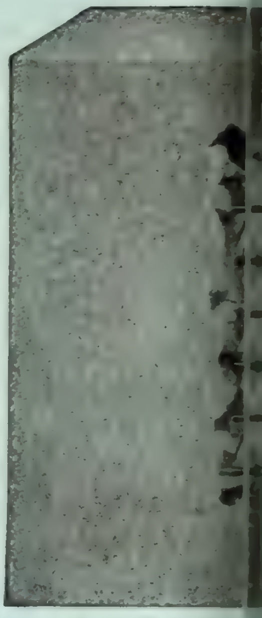
A concrete highway has to stand more than almost any other form of construction, because of the heavy motor traffic, abrasion and frost. It is equal to the heaviest work by reinforcing with steel.

The upheaval of frost is the concrete road's worst enemy. Both sides rise with the frost in the fall, and lower with the thaw in spring, making a great hinge of the center. The steel reinforcement holds the road against all cracks.

Triangl



The Steel

Steel and concret
sion, hence readil
great strength o
parted to every i

Send for boo

There is no form of road that is as economica, enduring and efficient as a concrete road. An when it is reinforced with steel fabric, it is pract- cally good for all time if the foundation an mixture is right.

The Canadian Ste

Ha

st Be Reinforced

**Steel has an affinity for concrete, the two prac-
ically expanding and contracting equally. The
reatest combination in the world is concrete and
steel.**

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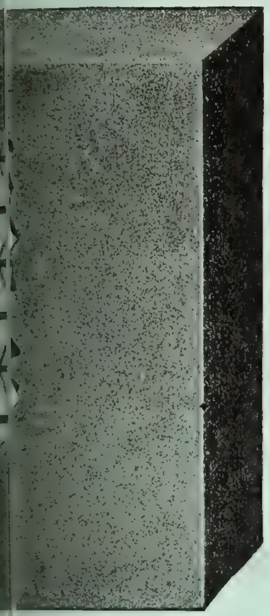

tin Concrete

me ratio of expan-
tegral mass. The
imperishably im-
in above manner.

Service, free.

Cracks do not harm a concrete highway if it is bound together with a fabric of steel. If not so bound, cracks will early destroy.

Concrete means permanence. If it cracks and splits for lack of reinforcing, it becomes very costly to keep in repair. Why take this chance when the cost of a steel reinforcing fabric is so small a part?

**Let us build steel reinforced concrete highways
hat will stand for all time on a once-for-all financ-
ng. Do not take chances on going before the
eople to issue new bonds to cover mistakes.**

Wire Co., Limited

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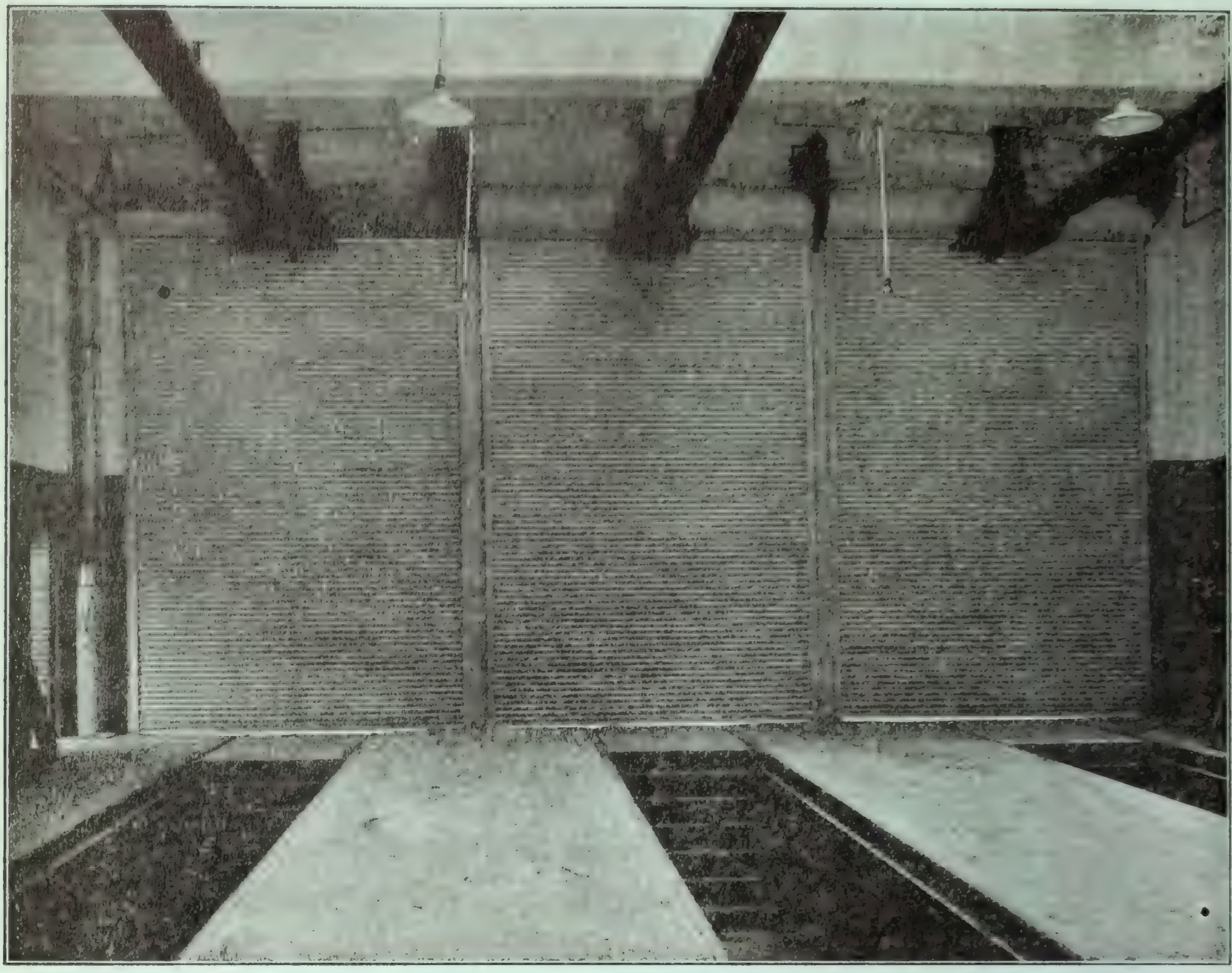

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No matter how large the opening to be protected or how located, Ormsby Rolling Steel Doors may be opened and closed easily. The ordinary sizes have counter-balancing springs and are very easy to raise or lower by hand. The larger doors are equipped with chain and gear: or may be motor driven as in the illustration shown above. In all sizes they offer the utmost in Fire Protection and command low Insurance Rates.

These doors require no swinging space or sliding room. They fit into many awkward corners where other types of doors could not be used.

They economize storage space and facilitate the handling of goods.

In designing or erecting Factories, Warehouses, Power Houses, Car Barns, etc., big savings in space and Insurance Rates can be effected bv the use of Ormsby Rolling Steel Doors.

Let us send you Prints and Working Drawings of these Doors.

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ESTABLISHED 1886

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reaching Architects, Engineers, Contractors
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An Aid to Successful Road Building

Ontario has been successful in its road-building activities partly because the citizens are alive to the advantages of good roads and are urging and sanctioning the construction of them, but also because the government is sincere in its efforts to provide adequate highway transportation facilities and meet the wishes of the people. Both of these factors were demonstrated in a very practical manner in the meetings last week of the Ontario Good Roads Association and the Conference of Road Engineers and Superintendents, both of which were held in the highway administration building of the Ontario government. The Ontario Good Roads Association which has now met continuously for twenty-one years, was primarily and still to some extent is an educative organization. Its aim has been to spread the gospel of good roads, to acquaint the people with their benefits and to urge their construction by government and municipal bodies. The seed that the association has sown has fallen on good ground and to-day it is seeing its efforts bear fruit in the splendid highway systems that network the whole province of Ontario. Much of the credit for this development is due to the association which has always maintained a close connection with the government and has offered suggestions and proposals that have been gratefully accepted and in a great many cases fully acted upon.

Of a more practical nature is the conference of county and township engineers and superintendents which meets under the direct auspices of the Ontario highways department. The Contract Record has several times commended this particular phase of the department's activities. Certainly nothing could accomplish more toward cementing the bond between the central highway body of the province and the men in the field than these conferences, which are annual affairs. A mutual discussion of practical questions is the best aid to uniformly good road building and it is such a frank exchange of ideas that has made these conferences such signal successes. The work they do is so valuable that no discontinuation of the practice should be suggested or tolerated.

Coal $30.00 a Ton

Discussing the coal situation the other day an engineer hazarded the estimate that, judged by prewar quality, he was paying the equivalent of thirty dollars a ton for coal this winter.

This is rather a startling statement and, indeed, one that cannot, as yet, be proven correct, but we must not overlook the fact that in spite of high prices we are being supplied with a grade of fuel that is vastly inferior to what we were accustomed to expect a few years ago. If tests prove this figure anywhere near accurate, however,—as we think it will be—we have at once a different basis upon which to argue the possibilities of utilizing our own Canadian fuel. As long as we think of high quality anthracite coal at $15.50, the idea of bringing in Welsh coal at the same price, or coke from Nova Scotia, is not attractive. Taking $30.00 a ton as the basic price gives us an entirely different viewpoint. Even electric heating will compete with this figure. One pound of good coal gives 13,000 B.t.u.—and costs 1.5 cents; since our furnaces, on the average, are only 40% efficient it actually costs us 3.75 cents to get 13,000 B.t.u. One kilowatt hour gives 3,412 B.t.u. or, 13,000 units of heat generated electrically cost 3.40 cents. There are a number of towns and cities in Canada where the household rate is .9 and the power rate much lower. The only trouble is that we haven't got any appreciable amount of electric power that can be used for house heating purposes.

However, there can be no doubt that, day by day, we are gradually approaching the condition where we must—and can—take care of ourselves. A hundred million or more dollars going out of Canada every year for an inferior quality of fuel, doled out to us as a favor, is a condition none of us relish. Let's prepare to look after ourselves.

Plant for Building Concrete Roads

What Constitutes Proper Organization and Equipment—Failure to Carefully Plan the Work Will Add Greatly to the Cost—Order and Progress of the Job, Selection of Plant and Capital Necessary.

By J. T. VOSHELL and R. E. TOMS
U.S. Bureau of Public Roads

When it is considered that from 50 to 60 per cent of the total cost of constructing a concrete pavement is chargeable to the equipment and labor employed in doing the work after the materials are delivered at the unloading plant, the importance of proper organization, proper equipment, and economical methods becomes clearly apparent. Failure to give these features proper consideration may easily result in adding from 10 to 25 per cent to the cost of a concrete pavement, and has no doubt frequently caused contractors to sustain a net loss on projects where profits might have been made.

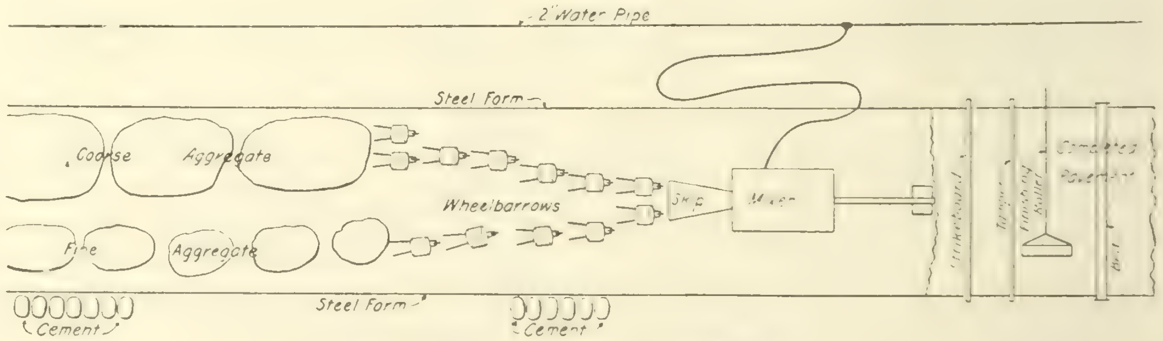
It is not the province of this article, which is based on a bulletin written by the authors and issued by the U. S. Department of Agriculture, to furnish detailed rules for the guidance of contractors in planning and executing their work, but it seems desirable to discuss briefly a few important points which contractors and engineers in charge of force account work should consider in concrete pavement construction. The points which are of most importance and to which the discussion will be confined are concerned first with the proper order and progress of the work; second, the selection of equipment; and, third, the amount of capital necessary to carry on the work economically.

Order and Progress of the Work

In constructing a concrete pavement it is especially desirable that the work of mixing and placing the concrete shall proceed without unnecessary interruption after it is begun. When the mixer is permitted to stand idle for even a few days, the force of laborers employed in operating it will usually become more or less disorganized and a certain amount of loss and unsatisfactory work will generally result when the mixing is resumed. On this account the order and progress of the work should ordinarily be planned with the primary view to keeping the mixer going full time every working day that the weather will permit. This means that ample provision should be made for completing the drainage structures, the grading, and the preparing of the subgrade well ahead of the mixer. Provision should also be made for supplying the mixer with all necessary materials. Where the materials are obtained by rail shipment, and it is expected that these shipments will be rather irregular, sufficient material for at least ½ to 1 mile of road should be stored on the subgrade or at the unloading yard before the mixing is started. This material can be stored with a comparatively small working force, so that an interruption of their work will not be as costly as a delay to the full hauling and mixing force.

Culverts Completed First

The small drainage structures should preferably be completed in advance of the grading in order to



ORGANIZATION AND EQUIPMENT

DISTRIBUTION OF FORCE

1 Foreman
7 Men wheeling coarse aggregate
3 Men loading coarse aggregate
4 Men wheeling fine aggregate
2 Men loading fine aggregate
2 Men handling cement
1 Mixer Engineer
1 Fireman
1 Formsetter
3 Men spreading concrete
2 Men striking off
2 Men tamping
1 Concrete finisher

NOTE

Men for preparing the subgrade, setting the forms, and covering the concrete with earth should be provided in addition to the above

This organization is capable of laying from 350 to 400 linear feet of pavement 8 inches thick 16 feet wide per 10 hour day under favorable conditions.

MAJOR EQUIPMENT

1 Four sack Concrete mixer
1 Road Roller
2 Wheelbarrows
1 Strike board
1 Tamper
1 Concrete finishing roller
1 Finishing belt
Pump and water pipe
Steel forms
Shovels, forks and miscellaneous

Fig. 1—Typical organization and plant layout, wheelbarrow equipment

obviate the necessity of moving embankment material the second time. They should always be completed in advance of the pavement. It is not economical to leave out a section of the pavement over a small culvert, and this practice should not be permitted. The extra expense involved in going back and putting in a section of this kind after the pavement has progressed a considerable distance ahead is usually considerable and is often underestimated. This method of doing the work also involves a delay in opening the road, adds two extra joints, and usually results in securing an improperly cured pavement over the culvert.

Organizing a force of laborers to operate a paving mixer efficiently requires considerable skill in handling men. The best results are generally obtained when a mixer is fully manned and each laborer is assigned a definite work to perform.

Diagrams showing ogranization and plant layout for a number of typical methods employed in concrete pavement construction are given in Figures 1 to 4, inclusive. These organizations and layouts have been used in actual construction work and have proved to be very satisfactory.

Equipment

Any discussion of equipment must necessarily be more or less general, because the same equipment is not always best suited for each particular piece of work. Each project possesses certain characteristics which determine the kind of equipment best adapted for handling it. A contractor may either wait until he has secured a contract before he decides on the type of equipment to purchase or he may purchase the equipment which he feels will give him the best satisfaction and only bid on work for which this equipment is suited.

The magnitude of the work should be a guide in purchasing equipment. One 2-sack mixer would be as much out of place on a 10-mile contract as an 8-sack mixer would be on a 1-mile contract. Considering the two extremes of too little equipment and too much equipment, the tendency of contractors, especially those just entering this class of work, is toward too much equipment. The success of a contractor upon the completion of any work should be measured by the amount of money the work has produced, not by the amount of equipment he has on hand. The aim of the contractor, therefore, should be to finish the work in specified time and use the smallest amount of equipment with which operations can be carried on economically.

The capacity of each piece of equipment purchased should bear its proper relation to the capacity of the combined equipment in order that all parts may be nicely balanced. A large mixer with a small unloading plant or poor transportation facilities would be a poorly balanced equipment on which the contractor would not receive proper returns in efficiency for his expenditure.

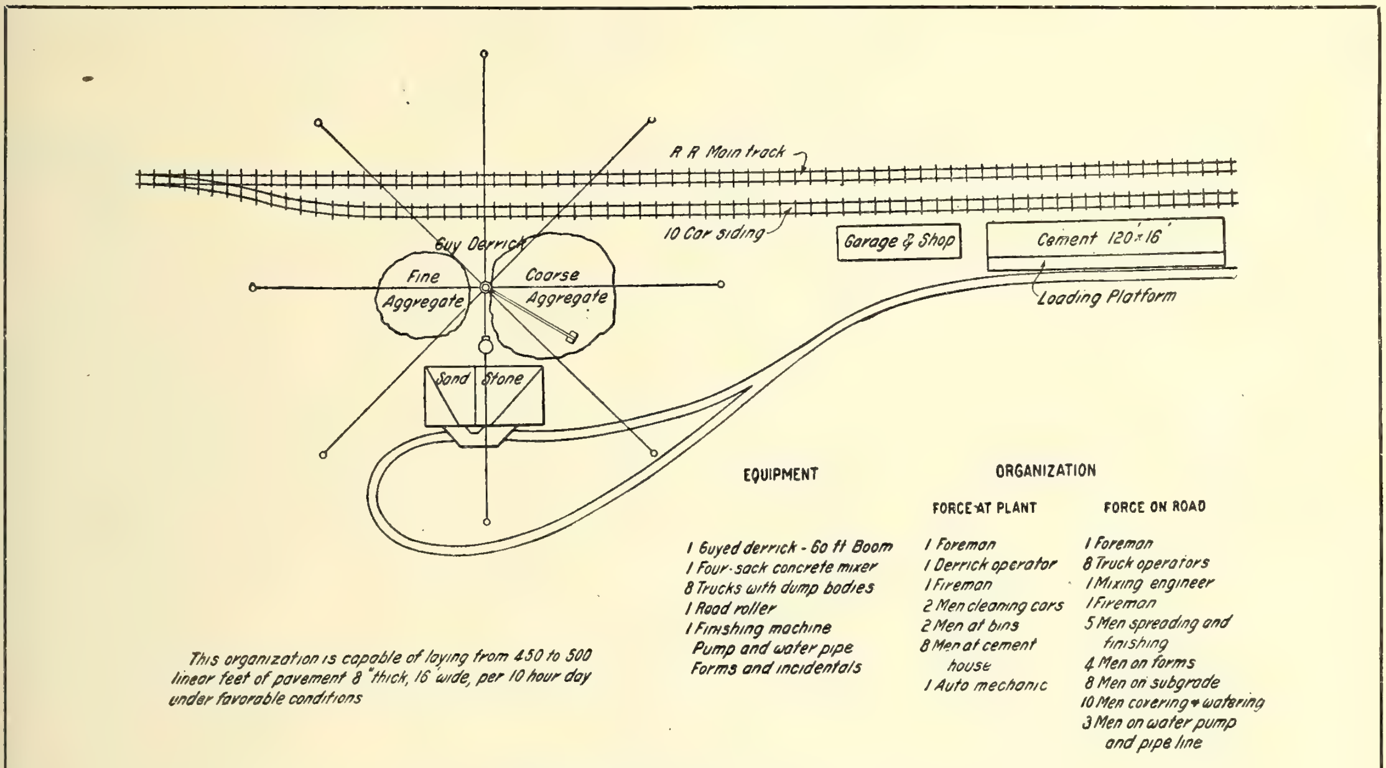


Fig. 2—Typical organization and plant layout, truck haul

The following list will give some idea of the cost of the various kinds of equipment used in building concrete pavements:

Locomotive cranes with clamshells	each	$15,000.00	to	$20,000.00
Automotive cranes with clamshells	do	6,500.00	to	12,000.00
Derrick cranes with clamshells	do	4,500.00	to	6,500.00
Mixers—4-sack capacity	do	6,500.00	to	9,000.00
Road rollers—macadam type	do	3,500.00	to	4,800.00
Industrial locomotives:				
Gasoline	do	2,500.00	to	4,500.00
Steam	do	5,000.00	to	8,000.00
Industrial railway cars	do	75.00	to	90.00
Industrial railway track, 24-inch gauge	per mile	4,500.00	to	5,800.00

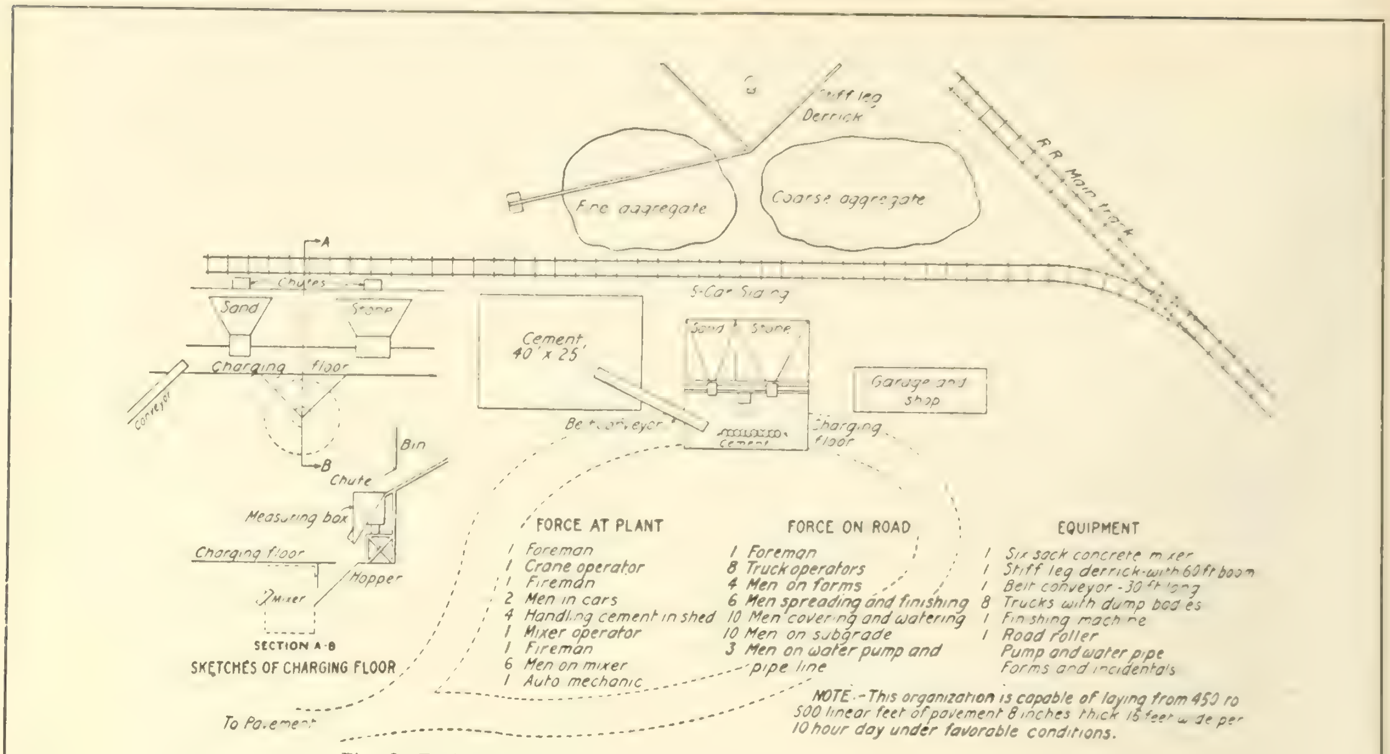


Fig. 3—Typical organization and plant layout, central mixing, truck haul

Industrial batch boxes ......each..	35.00	to	70.00
Concrete finishing machines ..do...	1,600.00	to	2,000.00
Steel forms .... .. Per lineal foot..	.50	to	.60
Subgrade planer .... each..	400.00	to	500.00
Water pump ....do...	600.00	to	1,000.00
2-inch wrought-iron pipe .... per lineal foot..	.22	to	.25
Tractor, caterpillar, 5-ton ....each..	5,500.00	to	6,500.00
Trucks, 3-ton capacity with dump bodies ....do...	3,000.00	to	5,000.00

The equipment necessary for doing the rough grading and building culverts in connection with concrete pavement work is not essentially different from that required for other types of pavements and needs no particular discussion here.

The total expenditure for equipment for preparing the subgrade mixing and placing and finishing the concrete depends on the rate at which it is proposed to carry on the work. Based on 1920 prices for equipment, a wheelbarrow outfit, consisting of a four-sack mixer, finishing machine, road roller, water pump, pipe, forms, and all other miscellaneous equipment, will cost approximately $18,000, exclusive of the grading, unloading, and hauling equipment. An

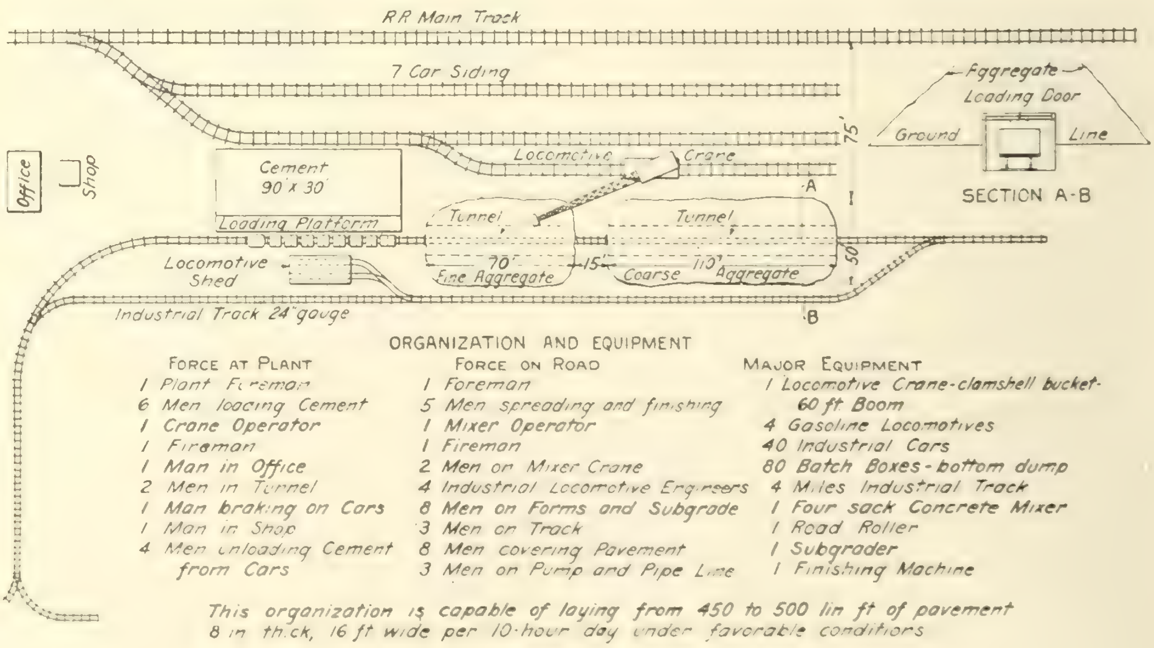


Fig. 4—Typical organization and plant layout, central proportioning, tunnel loading, industrial haul

industrial railway outfit, consisting of a four-sack mixer, unloading crane and clamshell bucket, 4 miles of industrial track, 60 industrial cars, 120 batch boxes, 4 gasoline locomotives, road rollers, subgrade planer, water pump, pipe, forms, and all other miscellaneous equipment, will cost approximately $75,000, exclusive of the grading equipment. The magnitude of this expenditure makes it imperative that considerable thought should be given to the selection of equipment and that a well-balanced outfit be secured.

Capital Required

The amount of capital required to carry on concrete-pavement construction depends almost wholly on the size of the project. As a general rule, the amount of working capital required after the equipment has been secured will vary from 5 to 10 per cent of the total amount of the contract. A small project will require a larger percentage of working capital than a large one; so that while a working capital of 10 per cent or over might be required on a comparatively small project, a relatively large project can often be handled with a working capital as low as 5 per cent of the contract total. The usual method of paying for the work provides for semi-monthly or monthly estimates to the contractor based upon the amount of work done, from which a nominal percentage is withheld until the completion of the work. Ordinarily this method should enable the contractor to meet most of his bills for labor and material after the first two or three estimates are paid.

The amount of working capital required also depends to a considerable extent upon the quantities of materials maintained in storage. Some storage of materials is nearly always necessary and it is especially desirable that these materials be stored during the off season. The storage of a large quantity of materials usually requires an outlay of capital greater than the average pavement contractor can afford to make. The buyers of the pavement, however, can relieve the contractor of the burden of carrying stored materials by paying for materials delivered and placed in storage. This policy enables the contractor to secure storage of materials at the cost of unloading, and by encouraging such storage the time of completion of the work is generally hastened, benefiting both the province or municipality and the contractor. This policy is recommended.

Should Concrete Roads be Reinforced?

The Functions of Steel Reinforcement and its Application to Road Work—Mesh of 40 lbs. Weight per 100 Square Feet is Found to Show Saving of $3500 per Mile in Construction Cost.

Steel reinforcement in the past has been used in concrete pavements, primarily to prevent excessive cracking. For this purpose it has been customary to use wire mesh or expanded metal weighing from 25 to 40 pounds per hundred square feet. Equally satisfactory results, however, can be obtained by the use of ½ inch deformed bars spaced 24 inches center to center in both directions. According to a bulletin issued by the U.S. Department of Agriculture this reinforcing should be placed not less than 2 inches from the finished surface of the pavement and should extend to within 2 inches of all joints, but not across them. Adjacent lengths of wire mesh or expanded metal should be lapped from 4 to 8 inches. For ease in handling, the wire mesh or expanded metal should be obtained in flat sheets. The use of this kind of reinforcement will add from 30 to 60 cents per square yard to the cost of the pavement and this additional cost is no doubt responsible for the fact that concrete pavements have not generally been reinforced in the past. Reinforcement of this type, moreover, does not entirely prevent cracks, but distributes them and keeps them small.

Reinforcement Gives Strength

Under very severe traffic conditions and for pavements laid on exceptionally soft subgrades which cannot be materially improved, reinforcement may be necessary to give greater strength to the pavement by distributing the load over a greater area. Deformed bars should be used for this reinforcement and the percentage of reinforcement required will depend on the traffic loads, the condition of the subgrade, and the range of temperature and the variation in percentage of moisture. The reinforcement bottom of the pavement and may vary from ½ to ¾ inch bars spaced from 18 to 24 inches center to center in both directions. Reinforcement to give added strength to the pavement is rapidly gaining favor among engineers, and it is now being extensively used in localities where a large volume of heavy traffic is to be expected.

Another form of pavement reinforcement—circumferential reinforcement—consists of ¾-inch bars, placed half way between the top and bottom of the pavement, approximately 6 inches from the edges, and completely around the slab. This form of reinforcement gives added strength at the edges where cracks usually begin, and on a soft subgrade serves to hold the pavement together should cracking occur.

In connection with the use of steel reinforcing in concrete roads it is interesting to have the opinion of H. Eltinge Breed, who was responsible for a great proportion of the roads of New York state. Mr. Breed gives his viewpoint as follows:

Steel reinforcing in concrete pavement tends, in the writer's opinion, to lessen cracking in the pavement, to render more innocuous those cracks that occur, to prolong the life of the pavement by relieving the fatigue due to tensile stresses, and to justify its cost by increasing the service of the road, decreasing its maintenance, and sometimes offsetting the necessity of additional depth of concrete.

The defect of the concrete pavement today is the cracks that appear upon its surface. If we can prevent these, we shall increase greatly the desirability of the concrete road. Although they have so far proved less serious than many other defects that mar our roads, still, cracks weaken the integrity of the pavement in which they appear, and in the effort toward improvement we want to eliminate them. These cracks are of two kinds, transverse and longitudinal. They are due, as far as we know, to these causes: Poor workmanship or poor materials, either of which is intolerable; contraction due to variations in temperature and moisture content; settlement of the subgrade; overloading and impact. Settlement is caused by frost action, by consolidation of the subgrade and by volume changes in the subgrade.

Steel Reinforcement is a Cure

The first of these causes we can and must prevent; the others we must offset. The most effective means of offsetting them that we have yet discovered is, I believe, the use of steel reinforcement.

After a thorough study the writer has, during the past few years, been designing his pavements with reinforcement of 40 pounds per 100 square feet, decreasing in many cases the thickness of the pavement as the amount of metal has been increased, and thereby offsetting costs. For instance, a pavement that would have been designed nine inches thick without reinforcement on a 10 to 8 section, was designed instead 8 inches thick with a steel reinforcement of 40 pounds per 100 square feet. At five dollars ($5.00) a square yard a 9-inch pavement is worth 55c per inch in depth. Forty pounds of metal per 100 square feet can be placed for about 25c per square yard figuring 6c a pound f.o.b. shop for the reinforcement. This would show a net saving of approximately $3,468.00 for a mile of pavement 18 feet wide, exclusive of the saving in cost of an inch excavation, and not considering the lengthened service of the pavement or its decreased maintenance due to the reinforcement.

Opinions on Reinforcing

The fact that reinforcing is still in the experimental stage makes it rather difficult to get definite opinions about it. Some questionnaires have been sent out with varying valuable results.

The committee on reinforcement for the second National Conference of Concrete Road Builders conducted just prior to 1916 a questionnaire by sending 844 letters to all engineers known to have laid any concrete road or pavement. Three hundred and nineteen replies were received. Of these there were tabulated the 40 per cent that furnished information about 300 miles of reinforced concrete roads and pavements. Partly on the basis of this information the recommendations of the committee were made.

They advocate the use of reinforcement on the following scale:

Width of Road	Weight of Metal per 100 sq. ft.	Sectional-area Trans.	Long.	Ratio
16	40	.09	.03	3 to 1
30	50	.12	.03	4 to 1
40	60	.15	.03	5 to 1

The committee report was not adopted, but a resolution was adopted, the sense of which was that the reinforcing be left to the discretion of the individual engineer. The conclusion of the convention is well expressed, however, in the recommended practice formulated by the committee on resolution and adopted by the convention which is as follows: "In general the use of reinforcement is advisable." This was one of the twelve fundamental principles adopted by this committee.

The committee on Concrete Roads and Pavements of the American Concrete Institute, of which the writer was chairman, selected a list of engineers who, it is generally recognized, have had extensive experience in concrete road and pavement construction and to them it sent a questionnaire in January, 1920. Sixty-six were sent out and 23 returned. The main idea of this questionnaire was to get such information as would help the committee in rewriting its specifications and recommended practice. Of the 23 engineers who replied, 13 used and believed in steel reinforcement. It is interesting to note that of those 13, 11 prefer the wire type of reinforcement as it gives a better distribution of steel and increases the bond strength on account of greater surface area.

Precautions

A few practical suggestions for future use of reinforcing steel may not be amiss, in view of the large amount of it that is being specified. One of the great dangers in using reinforcing steel is that road builders, given an additional factor of safety, may be tempted to use a leaner mix, and poorer materials and workmanship. Such building would only defeat its own purposes. Reinforcing steel is in no sense an apology for poor materials or poor construction. It would merely be added waste to use it in poor work.

On account of the fact that transverse cracks are not as dangerous as longitudinal cracks, and as the latter are the ones to be eliminated if possible on account of the destructive effect of traffic running along them, it would seem wise to take a metal that has a ratio of from 1 lengthwise to from 3½ to 5 across the pavement. Many of the standard styles made now have about this ratio and the writer believes it gives the best results. In city work, however, where transverse cracks are more detrimental, the ratio should be from 2½ to 1 cross wise to 1 lengthwise, depending on the length of the slab.

With the increased use of steel, slabs can be lengthened without the danger of transverse cracks.

No Relation Between Roads and Buildings

So far in all our road work we have been trying to build for the need of the day. Tomorrow has always overtaken us unprepared. During the last 15 years every year has seen an increase in loading and in density of traffic. However, legislative restriction has now limited the total load to about 30,000 pounds and the design of most of the pavements being built today has that maximum loading in mind. We are gradually getting our highway problems into more constant and fewer variable terms, but we do not yet know how large a part steel will play in road-building. Some have claimed that it will do for highways what it has done for structural building. This is improbable. Buildings and bridges are designed with certain definite, unyielding supports, with no supporting medium below certain parts of the slab; while in highway design all parts of the slab are supported with varying uniformity by a base estimated to give a certain amount of stability. It is this varying uniformity of base that precludes absolute accuracy unless one wants to design extravagantly against maximum weakness.

It is upon the observations given above, which are typical of many others that he has made, that the writer bases his statement about the two-fold function of steel reinforcing: It preserves the integrity of the pavement, and prolongs its life.

How Much Will be Spent In Canada During 1923 on the Building of Roads?

Fifty million dollars was the Contract Record's estimate of the amount of money spent on road construction during 1922. Information that has come in since this figure was mentioned in the December 27 issue has served to confirm the estimate. Yet, despite this big outlay, the country is not yet over-highwayed. A. W. Campbell, the chief comissioner of highways for the Dominion, claims that Canada is still suffering prodigious losses annually through poor highway transport facilities.

What, therefore are the roadbuilding prospects for the future? What will be the expenditure on construction and maintenance during 1923?

After a careful consideration of all the factors involved, the Contract Record has come to the conclusion that the volume of road work this year will approach very closely that of 1922, at prices that will be about the same. Consequently, fifty million dollars may again be taken to represent the money that will be spent this coming season.

In Ontario, for example, intensive work will be concentrated on the provincial roads. The authorities have promised that by the end of 1923, every bridge and culvert on the 1800-mile system will be completed, all the grading done, nearly all the widening accomplished and a large proportion of the paving finished. The amount of money that will be involved will be about the same as last year's amount—within a million or two of it at least. The counties and townships are planning renewed activity and while some have reached the limit of their borrowing power, they will continue road work under their general taxation. On the whole, therefore, in Ontario the prospects are as bright as last year.

The province of Quebec, through its Department of Roads, contemplates the improvement of about 550 miles of main trunk highways as compared with 477 in 1922. The municipalities are also expected to exceed last year's figures of 313 miles of improvement. New Brunswick anticipates the building of another 200 miles of gravel road, along with a large mileage of bituminous macadam under the Federal aid scheme. In Nova Scotia, 20 miles of macadam and 250 miles of gravel construction are contemplated. Last year's figures were 16 and 306 miles respectively.

No definite information is available respecting the other provinces, but indications are that the work this year will be no less intensive than last year. The people are "sold" on the idea of good roads and a few of the provinces are just beginning to take up federal aid, so that work may be expected to proceed in good volume.

On the whole, therefore, the prospects are very bright that the people of the Dominion will supply $50,000,000 for good roads this year.

Practical Road Building Problems Taken Up at Superintendents' Conference

Profitable Discussions Feature the Meeting of the County and Township Highway Officials of Ontario—Under Government Auspices Splendid Co-operation is Developed—Papers Are of Wide Interest and Should Appeal to All Road Builders

On February 26 and 27, the county and township road superintendents and engineers of Ontario met for their Ninth Annual Conference, under the auspices of the Ontario Department of Highways, in the department's building at the corner of University Ave. and Dundas St (the old Veterinary College Building). As usual, there was a large turnout of engineers and road officials at this popular conference for the discussion of practices and problems of road construction throughout Ontario and many interesting papers and lively, profitable discussions featured every session.

Hon. F. C. Biggs, Minister of Highways, was not present to welcome the delegates, owing to illness, but Mr. W. A. McLean, Deputy Minister of Highways, opened the conference with a few words of welcome and expressed his pleasure at the large turnout. Very little time, however, was taken up with preliminaries and the meeting got down to actual business with the reading of a paper on "Motor Truck and Team Haulage on County Roads" by Mr. Chas. Talbot, Middlesex County's engineer.

Motor Truck and Team Haulage on County Roads

A Comparison of Costs—A Plan for the Use of Surplus Labor—Regulations to Govern the Operation of Trucks on Road Work

By CHAS TALBOT

County Engineer, Middlesex County, Ont.

The cost of operating trucks cannot be reduced in proportion to the reduced wages for teams, as many farmers are now offering them for $4.00 per day. As long as the farmers of the country are willing to sell their labor or are so lacking in organization that their township and county councils can set a wage which is one third less than the actual value of the services rendered, just so long will the laborers and teamsters drift from the farms to the centres of population or accept the alternative of remaining in the country and laboring at the hardest kind of work for a wage insufficient to properly maintain themselves and families.

It is quite possible for a municipality to deliver gravel on the highways with trucks at as low a figure as they can deliver it with teams at $4.00 per day but a rural municipality should not purchase and use trucks to cut teamsters' wages, or operate them at all in opposition to local labor. In all cases where work can be carried on by utilizing the surplus labor of the farms it should be done. Better that the trucks be left in the garage than that they should be used in opposition to farmers who find it almost impossible under present conditions to make ends meet.

I am of the opinion that, for the present at least, a municipality should not purchase trucks or operate them so long as surplus farm labor is available for the work and such work should be paid for at a rate sufficient to net the laborer a profit rather than a loss.

During 1922 $6.25 per day was paid for suburban area teams. Regular teamsters on county roads received $6.00 and farm teams $5.25.

The minimum cost of hauling gravel with teams during 1922 was 29 cents per yard mile. The maximum price was 56 cents and the average price for season's work was 36 cents. These prices in all cases include loading but do not include spreading on road.

The following statement will assist in arriving at a price which would be reasonable to pay a teamster for his services:

Estimated Value of Outfit

Team	$300.00
Wagon	165.00
Harness	80.00
Total	$545.00

Cost of Maintenance—1 Month

1 ton hay	$15.00
1,080 lbs. oats	21.00
Horse shoeing	10.00
Driver at $15 per week	60.00
Stable rent	5.00
Depreciation on outfit (25% per annum)	11.35
	$122.95

Estimating that a teamster will work 20 days per month for twelve months in the year the daily wage should be $6.20.

Assuming that 1½ yards of material makes a load and that the distance averages 20 miles per day, the cost per yard mile will be 41 cents

Cost of Operating Trucks during 1922

Average haul, 5¼ miles one way
Average loads per day, 5
Average miles per day (round trips), 52½
Gasoline, 3.6 miles per gallon at 32 cents per gallon
Oil, 1 quart for 52½ miles
Each truck hauls 3 yds. equal to 78 ¾ yard miles per day
Number of days' work for season, 145
Number of trucks, 4
Loader, 1
Cost of plant, $30,000

Cost of operating 1 truck for 1 day:

Truck Driver	$4.50
Gasoline	4.66
Oil	.25
	9.41

Cost of operating 4 trucks for 1 day, $37.64

Cost of operating loader 1 day:

Operator	$4.50
Gasoline, 4 gallons	1.28
Oil, ½ quart	.12
Cost of team in pit, stripping and maintaining right of way	5.00
	$10.90

Cost of loading each truck per day, $2.72½, or $18.17 per cu. yard
Cost of hauling gravel per yard mile .. 11.94c.
Cost of loading gravel per yard mile 3.46
Cost of loading and hauling per yd. mile 15.40
Estimating depreciation, including repairs, at 25% of cost of plant, or in this case $7,500 per year, or nearly $52.00 per day, for 315 yard miles equals 16 cents per yard mile.
Total cost per yard mile, 15.40 cents plus 16 cents equals 31.40 cents.
Cost per year per truck for repairs, $409.52
Cost per year per truck for tires, $161.91

Following his paper, Mr. Talbot read the following list of regulations which he had compiled to govern the operation of trucks during 1923, to put this part of his plant on an organized basis and to forestall difficulties which had been experienced in the operation of trucks in the past.

Regulations for Operation of Trucks 1923

General Directions

One of the operators of the trucks or excavator shall be appointed foreman. He shall be responsible for hiring and discharging all men in connection with the work of loading, delivering and placing material. He shall have no responsibility for the construction of the road other than the delivery of the material. He is, however, to be responsible for the placing of the material as directed by the road foreman.

The right-of-way from the pit to the point of delivery is at all times to be kept in a good state of repair. Where a township road is being trucked over, the foreman shall at all times maintain it in a safe and serviceable condition for the trucks and after trucking is completed, is to leave the road in a level and good condition. When a county road is being trucked over, the foreman shall co-operate with the foreman of the road but the neglect of the road foreman will not relieve him from the responsibility of the proper maintenance of the road.

An accurate record of the cost of this work, done under the direction of the truck foreman, shall be kept by him and reported at least every two weeks to the county engineer.

Trucks

The foreman shall be responsible for the management and control of each truck and the excavator. The control of a truck shall not be assigned to any one driver unless the foreman considers it in the interests of the management of the work, so to do.

It shall also be the foreman's duty to see that the trucks are regularly greased, oiled and supplied with gasoline and water, and that mechanical parts are in proper order and that repairs are made at all times with as little delay as possible. Every part of the machinery shall be examined daily and loose nuts, grease cups, set screws, bolts, etc., tightened

Truck Foreman

The foreman may appoint one truck driver to become responsible for this part of the work, and may, if in his opinion he deems it advisable, allow this driver 50 cents per day extra, but his appointment will not relieve the foreman from his responsibility in the matter.

Wages

All men in connection with the work will be hired at a weekly wage and they shall be paid every two weeks. Every man hired, is to board and sleep in the county camp. No allowance will be made for meals or lodging away from the camp unless such meals and lodging are ordered by the foreman. Wages including board shall be as follows:— Foremen, $24.00 per week; truck drivers and operators, $18.00 per week. Teams when required will be paid $5.00 per day.

Lost Time and Overtime

When by reason of wet weather or broken machinery men are idle, they shall receive 75% of their regular pay the first day, 50% the second and third day and their pay shall be discontinued thereafter until the machines are again in operation or the roads are in fit condition to operate the trucks, unless the foreman can place the men repairing machinery, laboring in the pit or on right-of-way work, in which case they shall receive full pay.

Trucks shall be on duty ten hours each day; that is, each truck driver shall operate his truck ten hours daily. Time to start when the excavator operator starts to load his truck, except when the delay is caused by the loader in which case the time will start as soon as the truck driver is ready, but not before 7 o'clock a.m.

When a truck driver works less than ten hours the lost time shall be deducted from his regular wages. If he drives his truck more than ten hours he will be allowed the regular rate of wage per hour for the extra time.

On the first of July, Labor Day and Thanksgiving Day the men will be allowed off; all other days or part days on which they are off duty shall be deducted from their pay.

Orders for Supplies

In so far as possible the foreman shall receive an order from the county engineer for the purchase of repairs for machinery and supplies other than are ordinarily required, and shall in all other matters concerning the management of his work advise with and be directed by the county engineer.

Accounts

The foreman shall make out a separate time sheet for each road in each township, showing the number of hours each man works each day on each road, the number of cords of material delivered on each road and the average length of haul from the pit to the dump. On these time sheets shall also be entered the time of the operator of the shovel with his time divided on the different roads in the same way as the time of the truck drivers is divided.

He shall also make out a separate time sheet showing the hours spent by the men and teams in the pit and on right-of-way work, wages due the cook, supplies for camp (including fuel, groceries, etc)., with bills in each case, the time spent by a mechanic in repair of each truck, and all accounts for machinery repairs indicated by giving the truck number, etc.) and for what machine the repairs were purchased.

Accounts for gasoline and oil shall be O.K'd by the foreman and forwarded every two weeks with the time sheets. Payment of these accounts will be made direct to the dealers.

Truck operation sheets will be furnished each operator and these shall be filled up each evening by the operator on completion of the work.

* * *

Discussion

Mr. McLean felt that the farmer should be given an opportunity to keep his teams at work during the off-season on the farm, and at a fair rate of pay. The policy of the department, he stated, has been to base their rate on the prevailing rate paid by the county in which they are operating, with a minimum rate for the man of 25 cents an hour and for team, 55 cents per hour. Reports last year, he went on to say, to the effect that farmers were receiving as high as $10 and $12 per day on highway work, were misleading. On investigation, only one instance was found where anything like this rate was paid and it covered the supply as well as the hauling of stone.

In opening the discussion on Mr. Talbot's paper, Mr. John McCallum, Lambton County Road Superintendent, did not recommend the use of trucks for short hauls. In his particular county, he stated, a large section was without railway service and had practically no road metal, in which section they found it to the best advantage to utilize trucks. Their investment in road machinery amounted to $50,000, which was used only for long hauls. On the wage question, he stated they had no intention of lowering the rate for 1923.

Mr. Knister, Essex County Road Superintendent, was the next speaker. He stated they had very little experience in his county with trucks and had found, on one particular contract where the railway facilities were handy, that they could utilize this service cheaper for the transportation of materials, including the cost of loading and unloading on and off cars and the transporting of the material the remaining distance to the job by team, cheaper than by operating trucks.

One member suggested that teams be hired on the ton basis or yard-mile basis. His personal experience was that it paid to erect a scale which is necessary of course for operating on the ton basis, where the contract called for the laying of 12,000 yards of gravel hauled 4 miles.

Mr. Frank Pineo stated he had had considerable experience with trucks in Elgin County and was enthusiastic in his praise of this method of transporting materials. He was satisfied that he had cut his costs in half by utilizing trucks on certain of his contracts. He favored the heavy type of truck. Another member cited an instance where on a certain job a 5-ton truck, on a 4-mile haul, had done the work of 20 teams.

In reply to a question regarding the comparison of the four-wheel drive with the rear wheel drive on trucks, Mr. McCallum, who has operated both, stated that the former had more power, but were slower on the road and required slightly more fuel than the rear-drive. The four-wheel drive trucks haul a trailer, he further stated, and gave them good satisfaction.

Patrol Methods of Road Maintenance

A Combination of Maintenance and Construction is the Preferable Way to Handle a Large Mileage of Bad Roads—Effective System Adopted in the County of Bruce, Ontario

By G. E. STEPHENSON
County Engineer, Bruce County, Ont.

The afternoon session of the first day's proceedings opened with the reading of a paper by Mr. G. E. Stephenson, Bruce County Engineer, on "Patrol Maintenance," which follows.

There is no more important a problem in our highway work than maintenance, which is so often neglected with very bad results. By proper maintenance we are able to protect our initial investment and also add greatly to the comfort of the travelling public. This is true where roads of a high standard have been constructed but it may also be advisable for a county to spend a large amount of its funds for maintaining roads which have never been reconstructed, in this way gradually bringing them up to the Highway Department's standard.

For instance, when a county has a very large mileage of bad roads should not the first step be to widen out narrow roads and dangerous places and get as good drainage as possible at a reasonable cost, keep the old road bed well resurfaced and by a combination of maintenance and construction bring the whole system as quickly as possible to a higher standard? This should be done with a view to final construction according to the Department's standards so that none of the work would have to be undone. Later on when the roads are brought to as high a standard as possible without radical reconstruction methods the surplus funds could be devoted to reconstructing the heaviest travelled sections of the road according to standard requirements.

Maintenance as Well as Reconstruction

On the other hand, if a program of reconstruction only is carried out, many sections of the county will be suffering for years from very bad roads while others will be benefiting to a greater extent than the funds contributed by them would warrant. This would naturally cause a great deal of dissatisfaction. Even though reconstruction is contemplated immediately it is unwise to neglect maintenance as a small amount of money expended in this way will add greatly to the value of the roads to the public.

Before going further it might be wise to describe the condition of the roads in Bruce County, facilities for obtaining road materials, and the general organization.

Practically all the county roads run through rolling clay country with the exception of the north where there is a good deal of swamp and rock. Fortunately where roads have to be built through swamps there is plenty of stone nearby so that a rubble base can be put in. The whole county is blessed with an abundance of gravel, the haul seldom exceeding three miles, so that the gravel road is the only type of road in the county except in towns and villages.

To carry out extensive maintenance or construction work, foremen are employed for the whole season and permanent men to operate trucks, crushers, large graders, concrete mixers and other heavy types of machinery. An assistant superintendent or general foreman who has had considerable experience in construction work and the repair of machinery and who is responsible to the superintendent, is in charge of these permanent gangs. He is furnished with a half-ton truck and can stay a day or two on a job at his own discretion to help move machinery, make field repairs and get the job going, etc. He spends all of his time personally on one of these jobs unless other work is temporarily detailed to him and it is his duty to see that these jobs are run efficiently and the machinery kept in good repair. In short, the relation between assistant superintendent and superintendent is the same as between contractor and engineer with the exception that all reports and pay sheets are sent direct to the latter's office. Large expenditures for equipment and fuel are made through that office and if any costs are excessive, this matter is brought to his attention and steps taken to remedy them. These permanent foremen and men are directly responsible to the assistant superintendent and any instructions affecting them must go through him.

Road System Divided into Sections

The whole county road system is divided into sections of five or six miles in length, depending, of course, on local conditions and on each of these sections a patrolman is appointed by the superintendent. These men are responsible to the superintendent only and the assistant superintendent does not in any way interfere with them except when his gang is on their section. Before making the appointment of an applicant as patrolman, the superintendent usually asks for a recommendation from two or three of the local reeves or other responsible persons as no end of trouble can be caused by appointing an unsatisfactory man.

Five or six miles can usually be dragged in half a day and is about all the average man can attend to when devoting part time to work. Giving one man the maintenance of twenty to forty miles has been tried but has not worked out very satisfactorily. This necessitated his having a car; he usually did nothing but supervise the work and it generally caused a good deal of dissatisfaction among the public as they thought he was doing work which should be done by the superintendent.

Each patrolman is supplied with a drag or one team grader, or both, and a gravel screen when necessary, for which he is held responsible. The patrolmen are usually farmers and have their own teams, waggons, etc., so that they require very little equipment and no small tools are supplied except under special circumstances. They attend to all minor repairs and dragging on their own initiative and send in pay sheets and reports at required intervals and are paid five cents per hour more than labor which they may hire. A standard wage is set for labor and teams for the whole county.

The Patrolmen's Work

In the spring the superintendent visits each patrolman and indicates to him as closely as possible what work will be required of him during the season in addition to small repairs and dragging. This is usually confined to gravelling or other work which can be done by the patrolman as economically as by a permanent gang. The superintendent may also make frequent calls when extensive work is proceeding and if in going over the roads he notices any case of neglect, he makes a note of it and informs the patrolman by letter or telephone if he is unable to call on him personally.

A monthly report is sent to the superintendent's office in all cases but in order to keep in close touch with expenditure where extensive work is being done, reports are sent in at shorter intervals, weekly if $200.00 is spent within the week and fortnightly if $200.00 is spent during that period, so that in no case can a patrolman spend much over $200.00 without having the cost of his work checked.

On the face of the reports is shown the date and the number of hours each day which every man works, and each man's wages are distributed under such items as hauling, grading, handling and spreading gravel, dragging, etc. On the back of the report he reports the number of yards of gravel hauled, average distance hauled, total cost of handling, etc., so that we can get the cost per yard-mile for hauling and the cost per yard for loading and spreading. All work is reported in such a way that the unit cost of any class of work can be obtained. Each report is summarized and the summary put into a cost book, separate spaces being allowed to each patrolman and to each heavy piece of machinery. With this, costs can be compared and at a glance the cost of any piece of work, both total and unit, the efficiency of any patrolman, amount of work done by any expensive machine, cost of fuel, repairs, etc., can be obtained.

From the reports sent in by the patrolman a distribution sheet is prepared. This is signed by the chairman of the Highways Committee and the road superintendent, and along with the reports is sent to the treasurer's office for payment. Cheques are made out for each man and they are sent to the patrolman for distribution along with the original report or time sheet. Each man signs his name on the report on receiving his cheque and when all the cheques are delivered it is returned to the treasurer as a receipt which is filed with the corresponding distribution sheet. The advantage of returning the original report with the cheques is that if any dispute arises concerning the time it can be checked over at the time so as to show corrections, etc.

Most of the patrolmen have had no experience in construction work or in building roads according to present day methods and standards so that they require a good deal of information as to how to fill in reports, the best way to handle the different classes of work, what they are supposed to do on their own responsibility, etc. With such a large number of patrolmen it is difficult to give this information verbally and if done so, they might forget it. With this in mind, each patrolman is sent when required, a standard letter and is also supplied with a book of instructions.

* * *

The two speakers who were to introduce the discussion on Mr. Stephenson's paper were not present at the session, nevertheless an interesting exchange of opinion took place on the subject of maintenance by the patrol system. An important point brought out in this discussion was the care that should be taken to seeing that traffic is not inconvenienced by too heavy surfacing of gravel on the road.

It was generally recognized to be a much more satisfactory plan to place the maintenance of roads in the hands of a permanent patrol staff, the argument being that where this work was looked after by farmers of the district, they, the farmers, were naturally inclined to regard this work as secondary in importance to the work on their farms, while a permanent patrol force would have no other interest than the upkeep of the roads. Mr. Talbot, however, saw difficulty in the permanent patrol system, maintaining that the average wage at which farm labor can be obtained for this purpose, $5.50 per day for man and team, would not be sufficient for a man to live on. Mr. McLean went to some length to point out the comparative cost of living in the city and the country, the trend of his argument being that the above mentioned wage would go much further in the country than it would in the city.

Road Accounting and Cost Keeping

An Excellent System Developed by the County of Victoria, Ont., Records Essential Information and Provides an Analysis of all Operations With Very Little Clerical Assistance

By E. L. MILES
County Engineer, Victoria County, Ont.

The system of road accounting as applied to the superintendent's office can only realize its greatest value when sufficiently detailed for a cost analysis. A cost analysis cannot be effectively applied as a basis of information unless it is accompanied with full details. Cost records are, in fact, the library to which the superintendent turns for the essential information regarding his work, and the more complete these records are, the more easily they are to digest.

It has been said that records of this kind are not worth the trouble and time it takes to prepare them, because of the varied circumstances under which the work is operated. Be that as it may, the greatest value comes to the one who prepares the details, as he is able to pick up the weak points in the organization, and prepare himself for more efficient methods later on. Nor should that information be closely held in the superintendent's office, but rather given to the foreman in charge of the work, in order that he may see the results of the costs when compiled. Foremen thus given a chance to report upon their work often add valuable information which would otherwise be lost. Reliable information must be accompanied by a full history of the work, in order that the truth be known why Foreman Jones is building a similar road for $1,000.00 per mile less than Foreman Smith. Foreman Jones may be a better man than Foreman Smith in his methods of organization, in which case the superintendent does not need a cost sheet to draw this fact to his attention although he may need it to prove his argument.

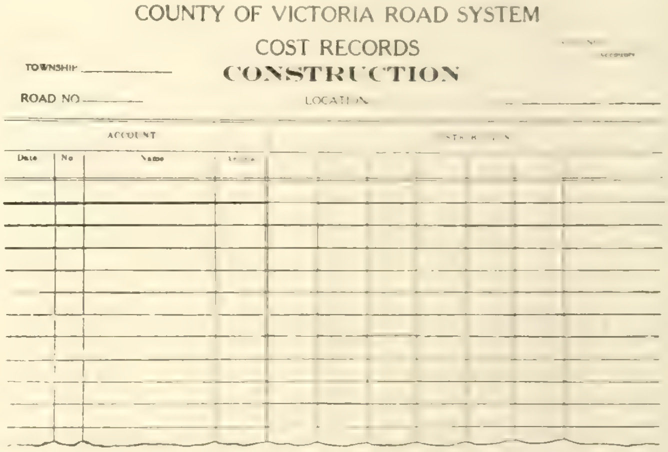
Mr. E. L. Miles

No Hide-bound Regulations

There are no hide-bound rules and regulations for the guidance of superintendents in compiling their cost records, as a means of accurate information; yet if he understands the information he has, and is able to digest it, the superintendent will be able to judge future work in a more intelligent way.

Cost records intelligently kept, so as to bring out the essential parts of the work, are always at hand to check up the organization, and to ascertain the economical limits of haul, of unit prices, of consumption, and other things which eat into the effectiveness of the work in hand. Dribbling losses can be corrected from time to time, and the superintendent is always protected from irregularities, if he systematically watches his cost sheets.

To illustrate this argument, let us take up the question of hauling, which is one of the most important items in road building. Given a piece of road to build, the average distance from the railway siding to the work is, say, one mile. What is the economical distance that field stone can be hauled and run through a crusher in competition with imported stone? Theoretically, this can be figured in the office, but unless a close check is kept on the work, say once a week, many dollars are wasted either in cutting out the crusher too soon, or not soon enough. Moving material is not a proportional item; that is, if it costs $1.00 to move a cu. yd. 1 mile, it does not mean that it costs $5.00 to move a cu. yd. 5 miles. It is surprising, if not educational, to note the difference between detailed estimated costs and actual costs from the cost records.



COUNTY OF VICTORIA ROAD SYSTEM

COST RECORDS

TOWNSHIP

CONSTRUCTION

ROAD NO

LOCATION

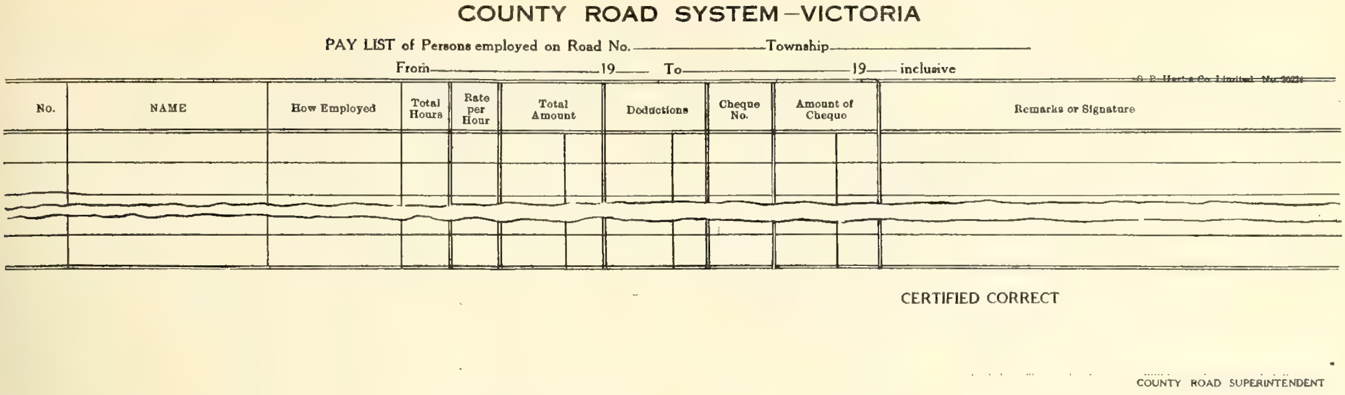
ACCOUNT

Date	No	Name

A similar cost record form is used for maintenance

Estimating Reduced to a Science

Estimating has been described as an art, but it may be reduced to a science. Prices of labor and material vary from time to time as do freight rates, and it is therefore necessary that each unit shall be separated in order that prices may be applied to new quantities. At any rate, cost records are concurrent with the times, and soon become obsolete unless accompanied by a complete history of the work. Con-



COUNTY ROAD SYSTEM—VICTORIA

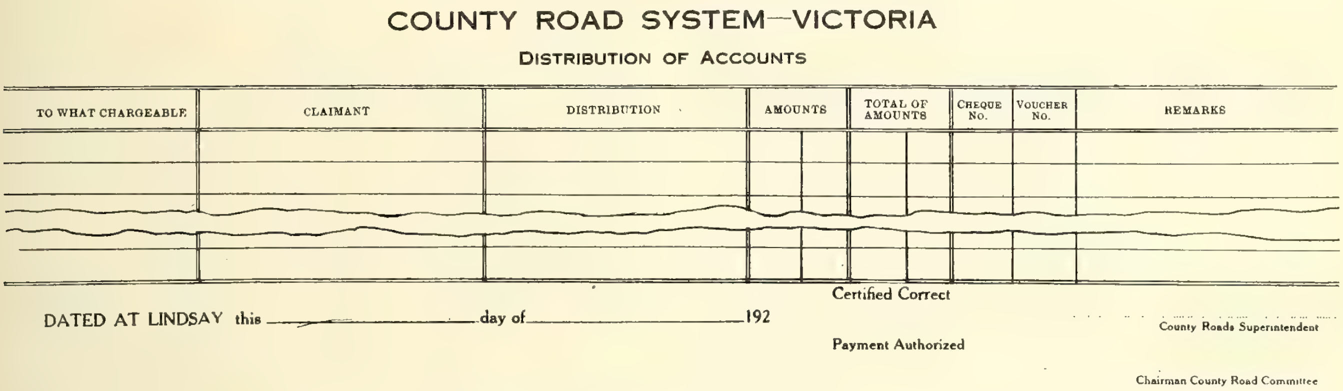
PAY LIST of Persons employed on Road No.________Township________

From________19____ To________19____ inclusive

No.	NAME	How Employed	Total Hours	Rate per Hour	Total Amount	Deductions	Cheque No.	Amount of Cheque	Remarks or Signature

CERTIFIED CORRECT

COUNTY ROAD SUPERINTENDENT



COUNTY ROAD SYSTEM—VICTORIA

DISTRIBUTION OF ACCOUNTS

TO WHAT CHARGEABLE	CLAIMANT	DISTRIBUTION	AMOUNTS	TOTAL OF AMOUNTS	CHEQUE NO.	VOUCHER NO.	REMARKS

Certified Correct

DATED AT LINDSAY this________day of________192

County Roads Superintendent

Payment Authorized

Chairman County Road Committee

The forms used for keeping the pay list and distribution of accounts

struction engineers are notorious for under-estimating work, and while no one believes this "art" to be intentional yet it does illustrate the lack of sufficient information.

As the writer is more familiar with the cost keeping system in use in the County of Victoria, perhaps it would not be amiss to describe that particular system in detail. First of all, we must have a reason for the system, and secondly a determination to carry it to its final conclusion. This suggests four subdivisions.—

First—Systematic collection of all the information.

Second—Regular payment of accounts and distribution of charges.

Third—Study of costs as the work progresses.

Fourth—An annual report to the County Council.

Our reason for the system is that we have purchased about $50,000 worth of road machinery, and are therefore committed largely to the "Day Labor" method of construction. Whether or not we are getting beneficial results as against the more popular "Contracting" methods is illustrated through our cost sheets, backed up by systematic collection of all the information.

Cost Records

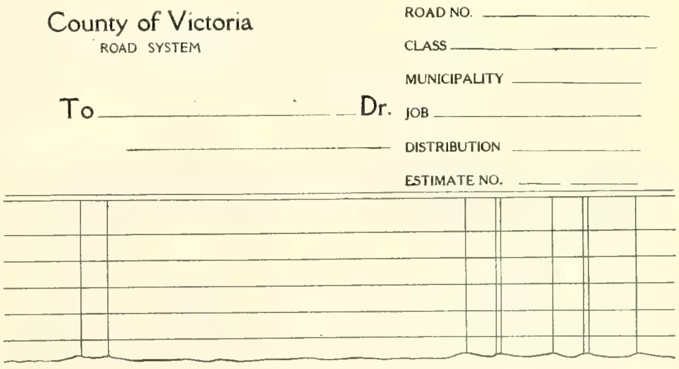
When a piece of construction work is authorized by the Road System Committee, a "Cost Record" sheet as per sample attached, is placed among the accounts on the file, (and in the form of a file and not as a book) for the particular road in question, and identified by the location such as Lot—Con.—Twp., as well as the historical name such as,—Hillhead Line, Agnew's Swamp, Kelly's Hill. We then determine what information we want on that particular job such as grading, material, freight, metalling, etc., without any consideration for the department returns, and then instruct the foreman to include these classifications when he submits his pay list, etc. (These details are of course totalled for the use of the Treasurer in making entries for the Department returns).

Having now decided upon the information desired for the work on hand, the bills commence to come in which are submitted under the following regulations: (Extract from Sup't. Annual Report 1922).

Time Books

Time Books are supplied by and remain the property of the Road System Board. They are numbered and recorded in the office of the Superintendent to whom they must be returned when filled in, or at the end of the season.

Time Books are to be entered at the end of each day, and in case of dispute with an employee, the foreman must always be able to take his oath clearly and conscientiously that his time book shows the



County of Victoria
ROAD SYSTEM

To________Dr.

ROAD NO.________
CLASS________
MUNICIPALITY________
JOB________
DISTRIBUTION________
ESTIMATE NO.________

Sheet used for payment of accounts

number of hours worked on each day, and that the record was made on the day shown.

Pay Lists

Pay lists are to be submitted to the superintendent's office on the forms provided at the end of each week. They shall be compiled, distributed and presented for endorsement to the County Road System Committee by the Superintendent every two weeks and duly paid. Names and initials must be correctly given, and special attention paid to employees names when one or more members of a family are shown.

The distribution or amount of money to be charged to each road, township, job and classification is most important and should be accurately recorded.

Every foreman is expected to examine the cheques received before being handed to the men, and in case of an error, the cheque should be immediately returned for correction. It is desirable that every cheque should be presented for payment as soon as possible, and not held by the owners, as the accounting department has considerable trouble and annoyances with outstanding cheques.

Field Accounts

The superintendent, general foreman, foreman in charge of work, and engineers in charge of machinery are the only persons authorized to order or receive goods on the County's account. In case of doubt, enquiries must be made at the Superintendent's office.

Accounts shall be rendered monthly no matter how small, in order that they may be checked, and charged, intelligently to the work to which they belong. They must be submitted in duplicate and a carbon copy for this purpose is suggested.

Accounts must be certified to by the authorized person ordering the supplies, before they are sent to the superintendent's office. The best way to do this is to have the foreman "O.K." and charge each purchase by signing the counter slip at the time of delivery. All such counter slips or orders shall be attached to the account when rendered. In case of delivery by truck, the counter slip should be certified to by the foreman and retained by the truck owner and attached to the owner's account at the end of the month. In this case, the owners account must be presented before the dealer's account can be checked and paid, unless he wants to get duplicate receipts from the foreman. The accounts as presented are duly checked and classified in the superintendent's office using a rubber stamp for a guide as follows:

DISTRIBUTION

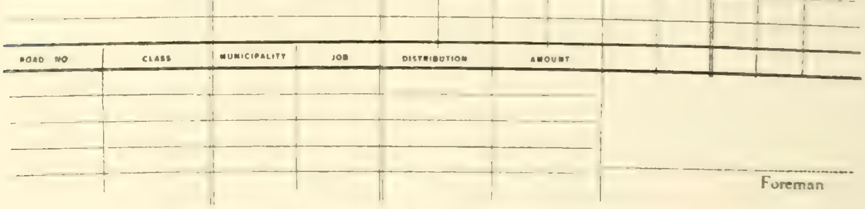
ROAD	CLASS	MUN.	JOB	DIS'N	CHQ.

Duplicate Always Retained

The clerk then enters the account upon a distribution sheet which in turn is brought before the Road System Committee for sanction and passed to the treasurer for payment. A duplicate copy of everything is retained in the superintendent's office and filed together under the date of the committee meeting. These accounts are then entered on their respective cost sheets, and when done, the superintendent can refer to them for his information.

Now supposing John Smith comes into the office, and complains that he has not been paid his wages or account, or that the cheque received is for the wrong amount. He states where he was working, or to whom he supplied the goods, and in a very short time through the assistance of the cost sheet which gives the date of the committee meeting, the numbers of the account, his name and the goods supplied, his original account can be turned up, and satisfaction be given to him as to its disposal.

During 1922, 4,631 cheques were issued in payment of wages and accounts, and there are of course many enquiries as to the number of hours allowed, rates etc., and it is therefore necessary to have everything in detail and accessible especially when operations are going on over 250 miles of road. You will notice from the regulations regarding the submission of accounts that the "Order Book" is dispensed with as far as possible. Supposing Foreman Jones wants


REPORT OF CONSTRUCTION FOREMAN FOR WEEK ENDING 192

DAY OF MONTH

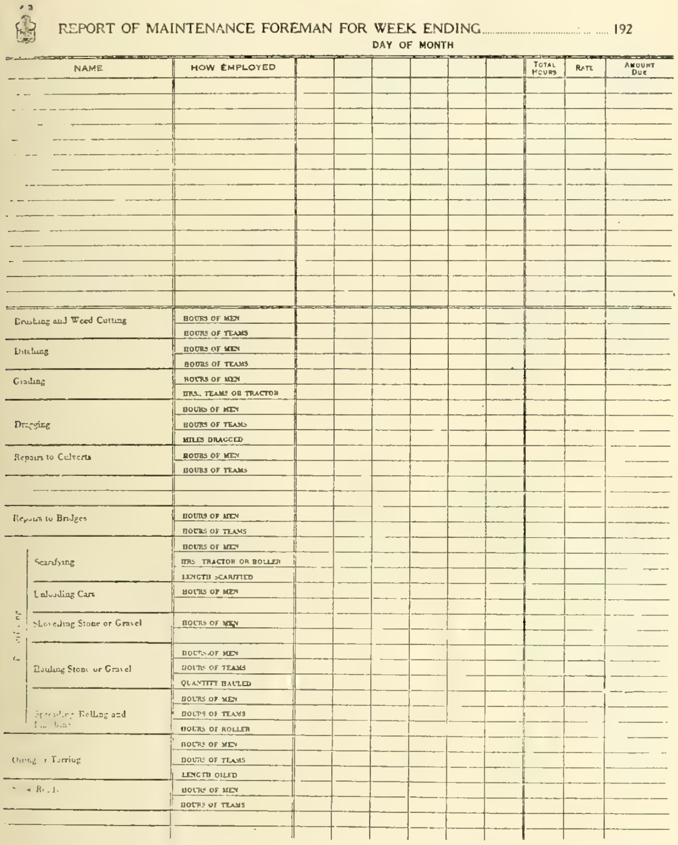
NAME | HOW EMPLOYED | TOTAL HOURS | RATE | AMOUNT DUE

ROAD NO | CLASS | MUNICIPALITY | JOB | DISTRIBUTION | AMOUNT

Foreman

The weekly summary sheet for construction operations

50 sacks of cement, and he writes an order for that amount to a certain dealer, when the truckman calls, he finds that the dealer mentioned has'nt any cement left, and he goes to another who happens to have only 25 sacks. The order is left to be changed of course, but it isn't always so treated, and the foreman and superintendent have difficulty in getting things to check up. Besides, the order book is always in a coat pocket some place else when wanted, and only about half the items are covered.



REPORT OF MAINTENANCE FOREMAN FOR WEEK ENDING 192

NAME	HOW EMPLOYED	DAY OF MONTH						TOTAL HOURS	RATE	AMOUNT DUE
Brushing and Weed Cutting	HOURS OF MEN									
	HOURS OF TEAMS									
Ditching	HOURS OF MEN									
	HOURS OF TEAMS									
Grading	HOURS OF MEN									
	HRS. TEAMS OR TRACTOR									
Dragging	HOURS OF MEN									
	HOURS OF TEAMS									
	MILES DRAGGED									
Repairs to Culverts	HOURS OF MEN									
	HOURS OF TEAMS									
Repairs to Bridges	HOURS OF MEN									
	HOURS OF TEAMS									
Scarifying	HOURS OF MEN									
	HRS. TRACTOR OR ROLLER									
	LENGTH SCARIFIED									
Unloading Cars	HOURS OF MEN									
Shovelling Stone or Gravel	HOURS OF MEN									
Hauling Stone or Gravel	HOURS OF MEN									
	HOURS OF TEAMS									
	QUANTITY HAULED									
Spreading Rolling and [illegible]	HOURS OF MEN									
	HOURS OF TEAMS									
	HOURS OF ROLLER									
Oiling or Tarring	HOURS OF MEN									
	HOURS OF TEAMS									
	LENGTH OILED									
[illegible] Roads	HOURS OF MEN									
	HOURS OF TEAMS									

Form for the maintenance foreman's report. A similar one is used by the bridge and culvert foremen

Checking is Simplified

Our system is to have the original counter slips certified to in the field by the foreman and classified when the goods are delivered, and the counter slip is then retained by the dealer and attached to the bill when it is submitted to the office. Checking is therefore very simple, and bills are not delayed by being carried around in somebody's pocket waiting signatures. Deliveries are usually made by truck drivers in town, who in turn submit their bill in detail showing just what material they hauled and where it went to, so this in turn is another check on the dealer and the foreman.

Another system we have in Lindsay is to arrange a similar price for our principal commodities with the various dealers, and give them all a chance to supply a certain quantity. The reason for this is to overcome storage of material in car lots if imported by the county, and therefore avoid store house checking and troubles incidental thereto.

Having now completed the work, the foreman is directed to collect all his bills and send them in for payment, and at the same time he is asked to submit a report which first of all gives the history of how he carried out his work, and any peculiar method adopted. He also fills in a form as follows:

The Foreman's Form

Type .... Road No. ....
Lots .... Con. .... Twp ....
Extent & History of work
Total length of road graded .... feet
Total length of road metalled .... feet
Width of graded road .... feet
Width of metalled surface .... feet
Area—graded surface .... Sq. yds.
Area—metalled surface .... Sq. yds.
Depth of metalled surface .... Inches
Depth of ditches .... Feet
Volume of graded material ....Cu. yds.
Volume of metal placed on road .... Cu. yds.
No. of loads of metal placed on road .... Number
Average total length of haul of metal .... Miles
Date started crushing.... Stopped.... Working days....
Total ....
Average No. of loads of metal hauled per day ....
Detail of cost (To be filled out in Supt's. office) ......
Grading .... cu. yds. Rate $....... $........
cu. yds.
Metal .... loads " ....
cords
Crushing .... cords " ....
Hauling .... " " ....
Spreading .... " " ....

Note—Any other unit of measurement or description of material can be used.

Results
.... Miles metalled " ....
.... Miles graded Rate .... $........
.... Sq. yds. graded " ....
.... Sq. yds. metalled " ....
Total rate per mile ....

Deductions

When the extent and history of the work is received, the superintendent adds the actual detail cost to the report, and makes his deductions. If he finds discrepancies, high costs, or even low costs or anything of that nature, which attracts attention, he immediately holds a conference between the general foreman, the foreman in charge of the work and himself, and together they find out the reasons of these over charges, or even the unexpected good showings, which information is used by all in the planning of the next job to be undertaken.

In using this or any other system of cost keeping, the essential point to bear in mind is not to over do it, or try to collect useless information. First of all try to keep a good check on the organization, and second procure sufficient information so that you can explain the entire transaction if called upon to do so from facts and figures.

Culverts and bridge records are also made by the foreman on the sample form herewith, and in addition to this, no structure is placed without written instructions from the office. In this way the complete history and cost of the work is kept. The item "Size of Opening" might be divided to show both the old and the new structure.

Form Covering Season's Work

At the end of the season, each maintenance foreman is asked to fill in a form covering his season's work, as well as another form covering his equipment. These returns are compiled, and submitted to the interested parties. Usually each Reeve receives a copy showing the number of miles of road constructed, number of miles gravelled, number of culverts placed etc., as well as a compilation showing the total cost of each individual piece of work duly classified for each township.

In conclusion, it might be said that the compilation of an "Annual Report" is the most instructive work that the superintendent can carry out individually. In gathering the data, he not only finds the discrepancies in his office system, but is able to view the results of his year's operation collectively, and can determine on some improvements for the season to come.

Looking at the annual report from another point of view, it might be said that the county council are entitled to know the history of the year's operations, and at the same time be coached as to the economics of highway building.

This year, the writer has divided the "Annual Report" into three headings,—

1. Economics of Highway Improvement.
2. Operation Results for 1922.
3. Rules and Regulations for the use of Foremen and as an appendix,—Maps, tables, cost records etc., are attached.

If complete records are systematically kept, there is no particular hardship attached to the submission of a report on any part of the work.

Discussion

Mr. D. W. McBurney, county road superintendent of Haldimand County, introduced the discussion on accounting, explaining the method adopted by his county for keeping accounts of road expenditures. The first point, Mr. McBurney said, was to secure a good foreman, who could render considerable help by supplying the superintendent or engineer with much information necessary to the keeping of complete records of cost, time, labor, etc. He advocated a simple system, however, and did not believe that the foreman should be bothered with numerous forms to fill out, etc. "Select a good man," he said, "and properly instruct him to give you the desired information." He also stressed the importance of carefully preparing estimates.

Mr. R. C. Muir, of the Highways Department, who occupied the chair at this session, made an announcement, at this point, to the effect that it was the intention of the department to send out in the near future a clerical inspector to the various road departments of the different counties and townships, not for the purpose of criticizing the accounting system, he explained, but to guide them in the establishment of a proper system, where such did not exist, for the purpose of supplying the department with accurate information relative to government subsidized roads.

Mr. Miles expressed great satisfaction with the cost record system, as outlined in his paper, stating that these records had enabled him to save his county money. In reply to an enquiry, he stated that he had only one assistant in his office, requiring no more clerical help than this with the system he operates.

It was pointed out by one member that the weekly report item of Mr. Miles' system could very easily be adopted in township road accounting, by making the report a job report instead of a weekly report—making out one of these reports on each job and sending it in to the clerk. Several other members, including Messrs. Marston, Talbot and Brookfield, took part in this discussion, referring to the system of accounting as practised in their respective counties.

COUNTY OF VICTORIA ROAD SYSTEM

Bridge and Culvert Record—Road No. 192

Line No.	Location			Historical Name	Type	Drainage Area	Size Opening			Width Roadway		Foundations	
	Lot	Con.	Tp.			Acres	Span or Diameter	Height or Length	Sq. Ft.	Structure	Fill	Depth	Material
1													
2													
3													
10													

	Materials					Labor Cost	Cost Structure only		Total Cu. Yds. or Length	Approaches		Dates	
	Gravel Loads	Cement Bbls.	R. Steel Lbs.	Lumber F B.M.	Piles Lin Ft.		Total	Per Cy Per Ft.		Earth C. Y.	Rip Rap C. Y.	Start	Stop
1													
2													
3													
4													
5													

Bridge and culvert record

Cost of Concrete Pavements

The cost of concrete pavements depends upon the amount of grading necessary, the number and size of culverts required, the cost of cement and the aggregates, the price and efficiency of labor, and the nearness of the work to the unloading stations. These factors are entirely dependent upon the location of the work and are seldom exactly the same even for two projects in the same locality.

The most satisfactory method of arriving at the probable cost of a proposed pavement is first to ascertain by survey the amount of the various kinds of work to be done and the quantities of the materials required. An itemized estimate based on these quantities and the unit costs which prevail in the community for such work and materials may then be made.

Organization Applied to Township Roads

The Responsibilities of the Township in Connection with Highway Matters and the Manner in Which it Can Most Effectively Meet Them— Statute Labor Fails to be of Service

By H. IRWIN
District County Road Engineer, Ontario Department of Highways

Introducing the subject of township roads, the next item on the program, Mr. McLean stated that the township roads of Ontario compare very favorably with the systems of feeder highways in the United States and the other provinces of Canada. He referred to the importance of this comparatively new member of the "Good Roads" family, the mileage of which is approximately four times that of county highways in this province.

A very excellent paper on "Township Road Organization"—one that pleased the meeting so much, indeed, that it was called for and re-read at the Wednesday afternoon session of the Ontario Goods Association, held in the same meeting place—was read by Mr. H. Irwin, district county road engineer of the Department of Highways. This paper is reprinted below.

Township Road Organization

A small dictionary defines organization as the logical arrangement of a task into suitable parts so that it may be performed efficiently. An efficient organization, like a good machine, must operate with a minimum loss of energy. The cost of township roadwork is, very largely, the cost of energy, the cost of machinery and materials being small as compared with the cost of labor. Township road organization is therefore the arrangement whereby a township undertakes to fulfill its responsibilities to the travelling public as regards the roads under its jurisdiction. A township council, as the administrative head of the municipality, is under this obligation: it must provide for its ratepayers, their friends, their produce and their merchandise, roads that may be used at all times with safety, with convenience, with economy and with dispatch. It must further perfrom this duty with a minimum waste of energy and a minimum expenditure of public funds.

Remembering that the business of keeping up township roads, like any other business undertaking, depends largely for its success or failure on organization; and remembering too, that the organization of any business is more readily understood if the work which that organization is to direct is fully comprehended, let us make a brief study of what the road responsibilities of our township council really are.

The Responsibility of the Township

We find that they concern two important factors:

(1) Maintenance.

(2) Construction.

To maintain a road adequately is to keep that road constantly up to the same standard of quality that it possessed when construction was finished. Our township roads, however, are not of a most desirable standard, generally. They were originally constructed for a different kind of traffic than that they are called upon to accommodate today, and few of them can be classed as finally constructed and subject only to maintenance. So we must qualify our definition of maintenance to suit actualities, and define it as the attention that is given our roads to keep them in suitable condition for present traffic. They must be kept smooth, free from holes and ruts; existing ditches must be kept open, shoulders must be kept trimmed and culvert ends and outlets in good repair. A good durable surface must be maintained against the combined forces of nature and traffic.

Under construction there is much consistent and methodical improvement to be effected to make our roads safe and reliable. Drainage, none too good at first, has been allowed to deteriorate. Ditches must be re-made, shoulders re-shaped, roads, culverts, bridges and fills widened, hills cut, and numerous other improvements of a more or less permanent nature are required.

Both these channels of expenditure, maintenance and construction, are limited owing to that prime essential of every public undertaking, Economy.

Such are the reasons for township road organization. A township that has equipped itself with a system that adequately maintains and consistently improves its roads, **economically** has mastered its largest problem and has protected itself against future embarrassment.

How Can Organization be Economical?

Now we come to a consideration of how best can our township organization function to be economical and efficient. Let us examine maintenance more carefully. Roads cannot take care of themselves against the forces of man and nature. Inequalities of heat and moisture, winds, frost and storm effects and the persistency of vegetable growth, combine with the effects of horses' hoofs, steel tires, pneumatic tires, heavy loads and speeding vehicles as to provide sources of constant and increasing injury to the road surface and often to the road foundation.

Against these injurious agencies there is one unfailing remedy, a preventive as well as a corrective. It is the stitch in time. That rut, puddle-hole, washout, broken tile, defective guard rail, damaged culvert end must be attended to for safety and economy's sake, as soon as it develops. If the township council, then, is to rest easy as regards its responsibilities for maintenance it must have an organization that will apply that stitch-in-time. No waiting for orders—no delay for next township council meeting's ruling.

Again, how can our township road system function as regards construction and general road improvement? Funds are limited. With the great calls upon the public purse for educational purposes, drainage and other utilities of one kind and another, together with the cost of maintaining the roads, there is not an abundance of funds left for construction. That is, if anything, an advantage. Our road organization is not designed to handle large annual expenditures on construction. Our construction policy must therefore be gradual extending over a period of years. But it must be consistent, methodical, positive, and according to a preconceived plan.

The almost overwhelming development of traffic, its increased weight, its increased speed, its increased intensity and variety have necessitated, in the interests of safety and economy, a change. Something more than merely keeping up out of the mud is required; something more than a single track is necessary. Roads must be wide enough, smooth enough, shoulders safe enough and ditches clear enough to eliminate the possibility of an accident to the average driver at 25 miles an hour. Hazards that were not significant when normal traffic varied in speed from 4 to 8 miles per hour are very important now that traffic may vary, legitimately from 4 to 25 miles an hour—or in actual instances from 4 to 40 miles an hour. Again the absence of horse-sense on the part of the motive power of today when approaching a dangerous spot must be reckoned with. All these factors and tendencies point to one thing. We must re-shape our township roads to cope with traffic conditions of today and of the future.

Methodical Improvement

The construction program of our township should, therefore extend over a period of years and should comprise the methodical improvement year by year of a certain mileage of township roads, so that at the end of 4 or 5 years there will have been developed a system of improved drainage throughout and of widening of all road bed, culverts, fills and bridges. This sounds like a gigantic undertaking for a township to consider, but it is not, and it can be carried out with little added expense. Having once accomplished this end, we will find, as we have found on our county roads, that the improved ditching has cut down the expense which is inevitable to-day after every spring freshet and almost every summer thunderstorm as well as during the wet periods of spring and fall. That is, it will have lowered our cost of maintenance. Further we will find that our road widening has had a wonderful effect on the cost of upkeep of the road surfaces; that traffic previously accustomed to adhering to single wheel tracks, wearing out the road unevenly, has distributed itself over the widened roadway, thereby utilizing all the gravel thereon, and has of its own accord helped to keep the road smooth, free from ruts and capable of shedding rain before it soaks into the road foundation. This again cuts down the cost of maintenance. So we arrive at an important deduction, namely, that this road improvement, this ditching, shouldering and road widening, is not in the nature of an expense but is a very wise investment of township funds, an investment which will pay dividends annually in future years in virtue of the decreased cost of maintaining an improved road as compared with the cost of trying to maintain an unimproved road.

So much for the necessity of township road organization, its aims, its objects, and the results to be obtained. Let us now take a frank, unbiased and straightforward look at ourselves. Is the present road organization in your township and mine fulfilling the obligation which rests with the township council as regards maintenance and construction? The most important question, however, is: Can the organization that we have in our township today be moulded into an efficient machine that will produce with reliance and economy the necessary results? The answer is, yes, or no, depending on whether you have abolished or retained the old statute labor system.

The Defects of Statute Labor

Statute labor involves, as you know, calling out the ratepayers to spend a specified number of days on the roads generally in June, July and August (when the roads are at their best) or whenever it is most convenient to the path-master and the majority of his men. There is no definite plan or program, other than that of each being credited with the required number of days or roadwork on the township books. This having been accomplished the average road beat receives little or no attention till the operation is repeated the following year, unless the local controller can be prevailed upon to let a few gravelling contracts. So by a patch here, and the promise of a patch there, the ratepayer is temporarily appeased regarding the condition of his road and it is tided over until the snow comes and casts a broad mantle of obscurity over the land and over the road. Let us consider now what has been left undone.

Townships average roughly 100 miles of township roads each. Less than 10% of that mileage receives any attention from the statute labor system in any one year. The attention is given during one or two weeks when the roads are generally at their best. For the balance of the year the 100 miles receive practically no statute labor attention. Further, over 90% of statute labor is performed in gravelling, and regravelling—filling in ruts (or is it time?) While it is everywhere conceded that drainage is the first essential of every road, very little attention is given to drainage by the statute labor process.

I hope you do not consider my criticism of statute labor as unfair. It is based on actual observation and careful study. I am endeavoring to show how futile is the effort of this system to keep a road at all times safe, comfortable, and economical of upkeep—a few loads of pit-run thrown on it every few years won't do it. There is no stitch-in-time policy in statute labor. Further, road beats are of fairly uniform length and receive about the same degree of attention, despite the fact that on some roads the traffic does not exceed a few vehicles a day while others, receiving the same scant attention, bear several hundred vehicles a day, and more on certain holidays and Sundays. Truly the statute labor system that had its defects 50 years ago, and served the country, neither adequately nor efficiently, but to a measure, nevertheless, is as unsuitable to the requirements of present day as a calendar for the year 1873 would be hanging on the wall of a modern business man's office.

At the beginning it was stated that there must be a minimum waste of energy and an economical expenditure of public funds. It was also stated that it is not your materials that make road work so expensive: it is your labor. Your organization must show the results commensurate with the cost. If it doesn't, don't blame the man who handles the shovel. It is our organization that is first at fault. Let us consider the statute labor system from the point of view of economy.

The Excess Cost of Statute Labor

Last year, and the year before, a careful study was made of the cost of applying gravel in each of 55 townships in Western Ontario. Some 30 townships had retained statute labor; some 25 had discarded it.

In all the former, statute labor work had to be supplemented by additional gravelling either by day labor or by contract. The cost per yard per mile of applying gravel by statute labor was $1.09. The cost ot the same operation by day labor or contract was 38 cents. These are average prices over a very large territory, comprising several hundred examples of each form of work and reducing them all to the cost of loading a yard of gravel, hauling it a mile, and spreading it on the road. This is called the cost per yard-mile, and is a measurement of **work** just as the pint is a measure of milk or the acre a measure of land. For day labor and contract work the average of 38 cents represents a fair day's pay for a fair day's work. The statute labor average of $1.09 proves wastefulness and inefficiency, and is in itself an answer to the question: Why doesn't the Highways Department pay a subsidy on statute labor?

What does this waste of energy, expressed in dollars, amount to?

Throughout Ontario there were approximately 637,000 days of statute labor last year at an average commuted value of $1·60 per day, or a total mutation value of $1,018,000. At the average price of $1.09 approximately 935,000 yard-miles of gravelling was done. Had this work been performed on a fair-wage basis of 38 cents per yard-mile, the amount of work done by statute labor would have cost only $355,000 representing a saving to the townships of $684,000. And a department subsidy of approximately $67,000 might have been added to that, making a total saving of over $750,000, or a saving per township equal to 1 3/4 mills on the dollar of assessed value of the townships concerned. You will not question the statement that the quality of the work done by contract or day labor is much superior to that done by statute labor, but you may be surprised to know that if yours is an average township, the carrying out of this work by day labor or contract, instead of by statute labor, would have meant an average saving equal to 1 3/4 mills of your mill rate.

But if we discard our statute labor organization we must have some organization to take its place. This organization must be thoroughly understood by the ratepayer or he will vigorously oppose abolishing the old system. And he is right. He is simply demanding protection for his road, knowing full well that his road will not take care of itself. The new organization must therefore undertake to keep his road in shape—and this applies to all the township roads.

Service to Traffic

How, then, should a township road organization be developed? We realize its necessity, its duties, the results to be acquired and the urgent need for economy. We realize, too that some townships roads receive 50 times as much traffic as others, that an excellent quality of gravel is adjacent to some roads while others are devoid of any suitable material, close at hand. We also realize that some roads are blessed with natural drainage, while others are a quagmire after almost every storm. Therefore we cannot divide our roads up into beats of 1 or 2 miles and give each the same amount of attention and expenditure. We find that we must go back to the fundamental principle underlying the road, i.e., service to traffic, and work up an organization from that, along business lines—remembering that the traffic, be it little or great, demands from us, safety, convenience, reliability, comfort, low cost of wear and tear on vehicles, and everything at the lowest possible cost to the township.

Realizing that the undertaking is a business proposition, let us draw up a plan of organization along the lines of a typical business or industrial corporation. The ratepayers are the shareholders. They are looking for results at minimum cost. They entrust their corporation affairs to a Board of Directors—the township council, with a president or reeve at its head. This township council is concerned with many matters resembling the responsibilities of an actual board of directors, legal, financial, educational, etc. We are concerned with one item, roads. If we follow that comparison one step farther we find in the company a works superintendent. This official is in charge of all the details of his department and is accountable to the board of directors for results. The responsibility is his to "deliver the goods" and he must organize his resources, i.e., his materials, machinery, men, and program with that in view. Corresponding to him we have our road superintendent. All responsibility and authority conferred by the township council and exercised over all employees are both centered in this executive officer. It is proven to be, as far as efficiency and economy go, the prime essential in the cycle of present day industry. The principle is as old as the hills. No man can serve two masters.

Management implies three things—a force, a result to be obtained, and a director of this force toward this desired result. If any one of these three things is omitted in any activity, be it road building or baseball, no such thing as management is possible. There must be a manager. We call him a township road superintendent.

The Road Superintendent's Duties

Now we may refer back to his chief worries—maintenance and construction.

Maintenance, we said, demands a stitch-in-time, unceasing vigilance and prompt attention to every road ill. Many of our counties have a patrol system to administer this stitch-in-time. It has proven a success wherever consistently tried, from all points of view, particularly actual service and economy.

If then our road superintendent divides up his hundred miles of road into sections, with a patrol man responsible for each section, its length varying from 5 to 15 miles depending on the amount of time the patrol men can devote to the road, and the demands of the traffic over it. We will find this system of maintenance extending over every mile of road—every mile under the supervision of one of 10 to 12 men each responsible to the township road superintendent for the condition of his section. What a relief to our stock holders, the ratepayers, to realize that "what we have we hold."

As regards construction, the superintendent, acting under the direction of his board of directors, commences a well studied plan of road improvement. It may be only an outfit consisting of a heavy grader, a tractor, a pick plow, slip scraper team and 4 men, engaged in ditching, shouldering and widening mile after mile of road without necessarily disturbing in any way the existing travelled portion. Probably 20 or 30 miles is a fair season's work for this outfit at an average cost of $50 to $60 per mile. Four or five season's work would treat every road in the township. This is just a suggestion of a consistent, meth-

[illegible] plan of township road improvement that will in time produce the required results, effectively and economically.

Other phases of the road superintendent's activities, such as his study of road peculiarities, gravel resources, handling of machinery and accounting of expenditures come under the subject of management, and not under organization.

I have endeavored to show that constant vigilance is absolutely essential, and that this problem is most economically solved in a patrol system; also that there must be a well defined program of road improvement to make our roads safe. I have further tried to emphasize the fact that the popular policy of consigning the boundary roads to the reeve and each of the four divisions to a councillor, and the old and obsolete statute labor system of calling men from their work on the farm and endeavoring to force them to put their hearts into road work when their hearts are in the hay-field, are not in accord with the long recognized principle underlying any industry, namely, that there must be a centralized control of energy if that energy is to be put to its best use.

* * *

Discussion

Mr. J. A. Flanders, Dereham Township road superinendent, in the discussion following Mr. Irwin's paper, cited figures substantiating Mr. Irwin's claim that money could be saved to the township by the abolition of statute labor and its substitution with day labor. Mr. Henry Grinstead, township road superintendent of South Dorchester Township, concurred with the opinion of the previous speakers with regard to statute labor and outlined in a general manner the methods employed in his township for the construction and maintenance of their roads and the organization for the control of their work.

Winter Preparations

The next item on the program was a short address on "Winter Preparation for the Construction Season," by G. R. Marston, county engineer of Norfolk County, who traced the activities of his department through the winter months in preparation for the following year's work. No great amount of planning can be done, he pointed out, until the council has made known their appropriation for road building and maintenance early in the year. Messrs. Alan K. Hay, Ottawa Surburban Roads engineer, and F. R. Rutherford, Lincoln County engineer, introduced the discussion following Mr. Marston's address, the latter pointing out the importance of preparing estimates as early as possible and where stone is required, securing this in the winter when it can be quarried much cheaper, owing to the reduced cost of labor. The discussion drifted into the difficulty of financing road construction and several suggestions as to the taxing of gasoline, tires, etc., to make up the dearth of funds, were proposed. Mr. Talbot thought perhaps they were going a little too far with these proposals and suggested that the programs be curbed where the funds were not sufficient. An argument for increasing the tax of motor users, put forth by one member, was that improved highways had saved the users of roads much time and expense by reason of the increased facilities for travel and the lower upkeep of vehicles and he thought that the payment for these roads should rest with the ones who derived the greatest benefit from them.

The matter of truck overload also came in for considerable discussion, a matter which is now taken care of under the Load of Vehicles Act.

This brought to a close the Ninth Annual Conference of County and Township Road Superintendents and Engineers. It was a success from every standpoint. The largest number of representatives ever present at any of these gatherings was on hand this year and the quality of the papers read was certainly above the average. The discussions, too, which rightly occupied a very large portion of the program of this conference, were particularly interesting and there is no doubt each and every delegate carried away with him some valuable information about the way the other fellow handles the many problems of constructing and maintaining roads and the many necessary points to be observed in the organizing of the various departments of a system to successfully carry out this work.

Important Figures at Road Superintendent's Conference

W. A. McLean, deputy minister of highways for Ontario

A. C. Parker, departmental secy.

Geo. Hogarth, chief enginer of highways of Ontario

The steel superstructure frame for the Montreal City Hall is being proceeded with at the present time. Fabrication and erection are being carried out by Dominion Bridge Co. The old walls remaining after the fire last year are to be repaired and used for the reconstructed building.

THE TENTH CONGRESS OF THE CANADIAN GOOD ROADS ASSOCIATION

The city of Hamilton, Ont., has been selected for the tenth annual convention of the Canadian Good Roads Association, and the delegates who will assemble there on June 11, 12, 13 and 14 from all parts of the Dominion will have before them a program which will be more advanced than that presented at any of the previous gatherings of the organization.

From the skeleton program already prepared it is evident that the executive have realized the necessity of emphasizing the economic factor in road building, and will seek to provide for the delegates data which will be invaluable to municipal authorities and officials in carrying out construction programs in the future. From every province in the Dominion, as well as from the United States Bureau of Public Roads information will be secured as to the details of cost in both construction and maintenance, so that comparisons can be made and highway engineers and public bodies enabled to ascertain the most economical methods of work, bearing in mind the relation of cost to efficiency and good service. This is one of the most important phases of the highway problem, because in some provinces there has grown up an idea that the expenditures made on permanent highways have been in excess of necessity, but in the absence of tabulated cost data it has been difficult to place the finger on the extravagant spot. At the Hamilton convention engineers and others will be able to make detailed comparisons and by discussion ascertain the means of securing economy with efficiency.

Linked up with the question of cost will be that of the use and abuse of the highways. The builder of the highway and the user of it have in the past failed to realize that they have many interests in common, that improved highways can only be built and maintained if they work in co-operation. Modern traffic conditions have revolutionized highway construction, and at the convention there will be discussions not only on types of roads, but also on the use of them, on the best methods of regulating the traffic of autobusses, of commercial trucks, their speed and load, as well as the question of uniform danger signals and direction signs, headlights, lights on all vehicles and other matters affecting the safety of the users of the highway.

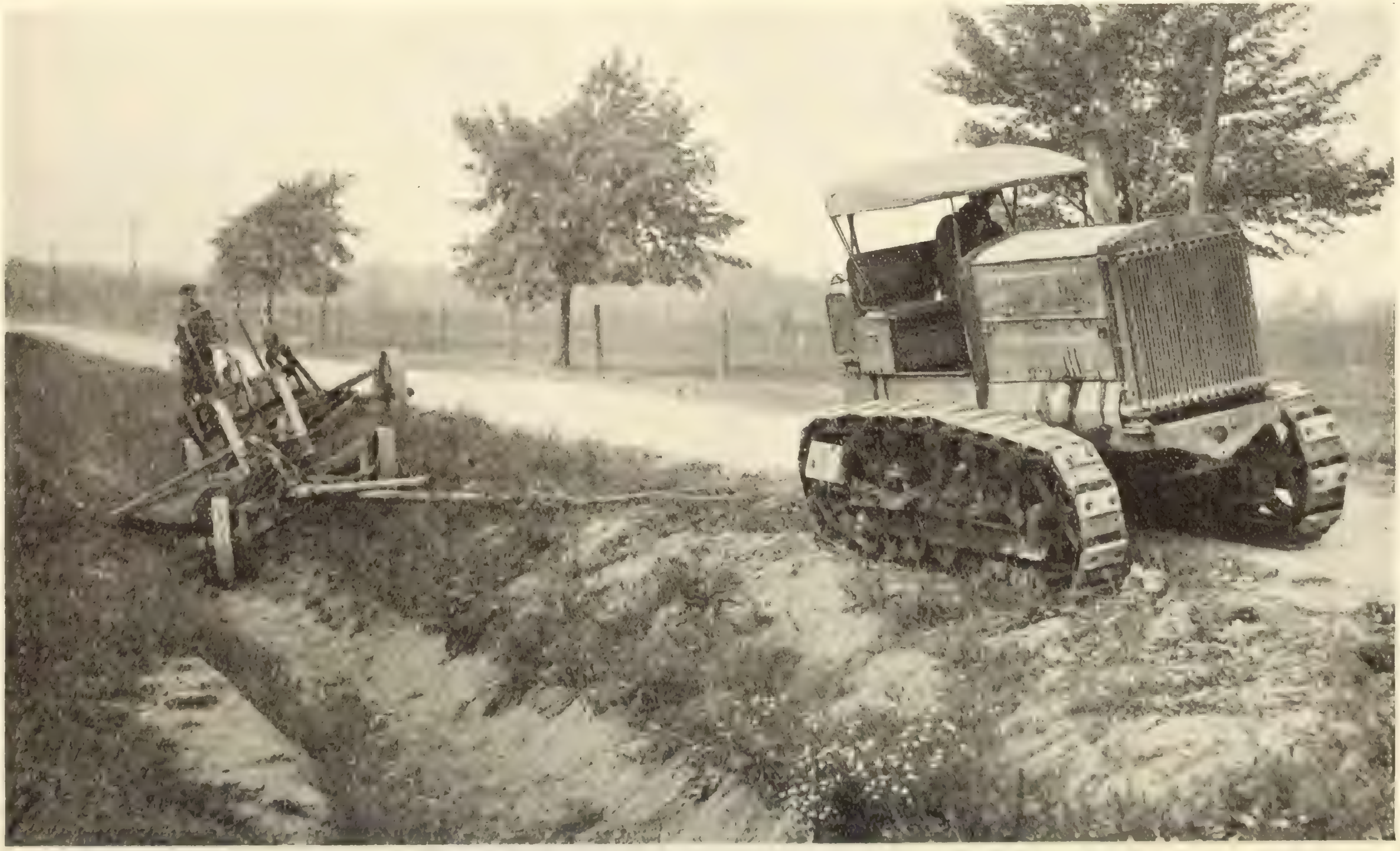
The conventions of the Canadian Good Roads Association have been held from coast to coast during the past ten years, and Hamilton was chosen for this year not only because it is centrally located but it is perhaps the one city from which radiates the largest number of modern improved highways. The province of Ontario has made rapid strides in road building in the last few years and the delegates to the convention will not only have the opportunity of inspecting several of the new highways, but will also have practical demonstrations of how these highways are built, for additional work will be in progress in June.

The full program has not yet been prepared, but it will certainly provide opportunities for discussing the latest information obtainable regarding the test road experiments that are being carried out in the United States, as well as the important subjects of federal aid, and tourist traffic, in addition to papers on different methods of maintenance—one of the most difficult problems that highway authorities now have to face.

The convention will take place at the Royal Connaught Hotel under the presidency of the Hon. J. L. Perron, Minister of Highways for the Province of Quebec, and the president of the Canadian Good Roads Association. The details of the convention are as usual being arranged by S. L. Squire, chairman of the Executive, and George A. McNamee, secretary, New Birks Building, Montreal, with the assistance of a strong executive board.

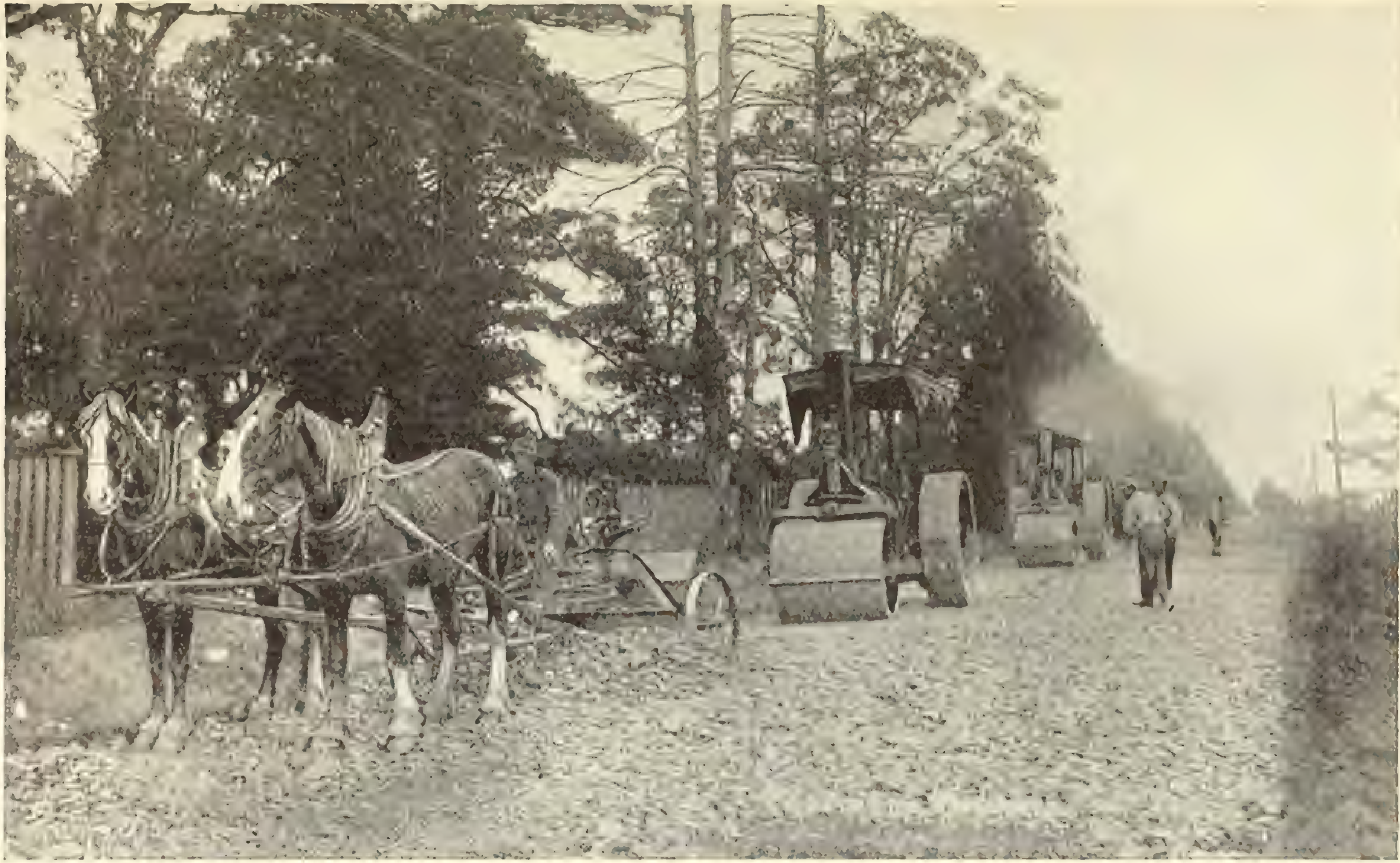
HAMILTON, ONT.—June 11-14

Road Construction Scenes in Ontario



Ditching Near Lundy's Lane, Welland County, Ont.

Road Construction Scenes in Ontario



Macadam Road Work, Ancaster Township. Contractors: Dufferin Construction Co.

Is Interest in Good Roads Waning?

An Attendance of Over 500 at the Convention of the Ontario Good Roads Association is the Answer

A Record Registration Marks the Twenty-first Annual Meeting of the Organization—Warm Discussions Indicate Widespread Interest—The Question of Financial Responsibility Raises Some Contentious Points—Resolutions Suggest Reforms

The twenty-first annual meeting of the Ontario Good Roads Association opened on Wednesday morning, February 28th, in the Highways Department Building, at the corner of University and Dundas Street, with a record attendance on hand. The registered attendance was slightly over 500, including representatives of every section of the province, filling the large auditorium to capacity at every session.

The president of the association, Mr. W. H. Brown, of Chesley, was in the chair and in opening the first session of the conference, he said, in part "This is a parliament of municipal representatives and what you do here may, within a short space of time, become legislation. It is, therefore, necessary that each and every one take active part, giving thought and consideration to the needs and necessities that exist from a road building standpoint, so that legislation that is desirable may be enacted."

The first item of business was the appointment of the nominating committee, which is composed of 10 members, 5 appointed by the president and 5 from the floor of the house. Those members appointed by the president were Messrs. Kennedy, Jamieson, Mahoney, Squire and Senecal, and those nominated from the floor of the house were Messrs. Walsh, Drumgole, Hanton, Oliver and Church.

The appointment of the resolutions committee was the next matter dealt with. The usual procedure in the past has been for the president to appoint a chairman and two members, these to act with the wardens of each county and the mover and seconder of each resolution, making up the resolutions committee. On a suggestion of city engineer Brian of Windsor, however, the chairman of the various Suburban Area Commissions throughout the province were added to the resolutions committee this year, Mr. Brian contending that the cities were not adequately represented on this important committee. The president appointed Mr. Sanderson, chairman, and Messrs. Squire and Wheelock as members of this committee.

On a motion by Mr. Rose, seconded by Mr. Mahoney, Messrs. Talbot and Hanna were appointed auditors of the association for this year.

President's Annual Address

The president, Mr. Brown, then read his annual address, which follows in full.

"As your president for the past year and on behalf of the loyal and energetic executive of this association, it gives me great pleasure to extend to you a most hearty welcome to this annual convention. I am, and always have been, greatly interested in the transportation problems of this young Canada of ours. The transportation problems of any country are great and very essential to economic and national life and are embodied in three distinct and separate means of transportation: highways, railroads and waterways. At the present time transportation is one of the greatest national problems with which we, as a young nation, have to deal and our fearless approach, careful consideration and timely decision will go a long way toward the betterment of our people and aid, in no small way, to remove feelings of unrest and, among other things, to keep united the people of Canada, which means so much for our future as a nation. While there are three main means of transportation, I believe the most important is highway transportation and with this part of our transportation system this association endeavors to deal from a provincial standpoint.

"In the province of Ontario, in which this association is particularly interested, we have great and urgent need for improved and better road conditions. This need has been brought about by the great and rapid change in traffic conditions and with this change, the people, with and through their public representatives and bodies, have to deal.

"It would be an indication of stagnation and very unlike the people of Ontario if we endeavored to arrange and hold our traffic conditions back to the capabilities of roads. We have not thought of doing this, but what we must do and that which we will do, in fact that which our association stands for, is to restrict unreasonable traffic, wage war on the road hog and reckless man of the highway and encourage the construction and maintenance of reasonable and legitimate traffic conditions.

A Well Balanced Highway System

"In our province we have what we think is a desirable and well-balanced highway system and on paper it surely is and, I think, surely will be when we have had time to cope with the situation and complete, at least in part, that which has been undertaken.

"This association does not, nor never has, stood for and advocated the construction of what is commonly called "joy-ride" roads, but, on the contrary, is and has been advocating and supporting the construction and maintenance of essential roads through the province, of a standard of efficiency that will successfully take care of traffic which they are called upon to carry, and if we had these, I feel sure that we will have all we can take care of from a road building standpoint. In speaking of roads for joy riders, in my opinion the time is yet in the distance when we should give time or support towards roads for luxury, but rather give our support towards the roads which are essential to the betterment of the people.

Importance of Township Roads

"The roads in Ontario are divided into 5 groups or systems, namely, township roads, county roads, provincial county roads, provincial roads and suburban area roads. Some of these systems have been in effect for some years and are giving the desired results and while all of the highway systems in Ontario are very important and essential towards the betterment of road conditions, yet I think that the township road system is among the most important, because of the fact that it is the most recent addition to the organization of the provincial highway system. For this, as well as for other reasons, those who have had in hand the arranging of the program for this convention have given township roads a prominent place on the program.

"In all things there is a beginning and to my mind the beginning of road construction should be where and from the place where the need exists to the point of destination, which, in the very great majority of cases, is from the farm to the place where marketing is done. For this, as well as other reasons, I think that the township road is among the most importane and is deserving of our consideration and support.

"No road is a road unto itself, but rather a link in a great chain. Every municipality in Ontario has a road responsibility in that its roads are part of the sum total of our provincial highway system.

"The owner cannot be divorced from the road, nor the road taken away from the user. They go together, hence the necessity of the investment of large sums of money in the construction and maintenance of our highway system. We must protect this investment and so far as possible make it pay dividends by reducing the cost of haulage, increasing the value of property and other holdings and by bettering conditions generally.

"If, while our township roads are being maintained and constructed, we successfully carry on our county and other highway systems throughout the province, we will be doing a great and noble work—a work that will mean a great deal toward the betterment and comfort of our people and the building up of this young nation.

"In conclusion, permit me to say that this convention is your convention and that, while we have certain rules and regulations to follow, still it is your duty to take an active part in the proceedings and I trust that you will avail yourself of the opportunity."

This brought to a close the first session of the convention.

His Honor Lieut.-Governor Cockshutt, of Ontario, delivered an address of welcome to the delegates on the opening of the afternoon session and also spoke briefly on the fine development of good roads during recent years. The old method of looking after the highways was a haphazard one in spite of the fact that highway transportation is one of the most important problems of a province which is so largely made up of agricultural interests, he stated. He pointed out that the cause of agriculture should be carefully guarded from all angles, since it was the basic industry of Ontario and of the Dominion, and he felt that any money which is spent on good roads to bring about greater contentment on the part of the farm dwellers, would be money well expended.

Mayor Maguire, of Toronto, then welcomed the delegates to the city and also took advantage of the opportunity to refute certain criticisms made at last year's meeting, to the fact that Toronto was not doing her share towards the financing of good roads in the province. He pointed out that since 1911 the city has contributed $1,362,000, exclusive of its share under the terms of the Provincial Highways Act, and that, under the latter arrangement, Toronto is committed to an outlay of $1,000,000 during the next five years.

The Mayor objected to criticism, and he went on to point out that in York County the city has spent $957,000, compared with $786,000 spent by the county on the same roadways. Also, he felt that the attitude of the city towards the future, is committing itself to an outlay of another $1,000,000 for provincial suburban roads, has forestalled any criticism which can be leveled from the same quarters. Referring to highway improvement in general, Mayor Maguire declared that the results already achieved have justified the idea, and he pointed out that the present stage of efficiency could not have been reached except for the persistent agitations of the pioneer highway enthusiasts and much credit is due to them.

Township Roads

Mr. T. J. Mahoney, of Hamilton, replied to the addresses of welcome in a few appropriate words and the balance of the afternoon was taken up with a general discussion of the increasingly important subject of "Township Roads," Mr. W. Hambly opening the discussion and Mr. J. H. Todd, of Yarmouth Township, also speaking at some length on this subject. The latter gentleman, in his opening remarks, stressed the important part that township roads play in the general highway system of any country. The big trouble in his district, he stated, was the financing of the construction. The only real construction work they had done was on steep hills and the installing of culverts, he personally favoring the steel type of culvert. Their program had consisted chiefly in the maintenance of roads. He went into considerable detail as to the methods employed in the maintenance of their roads. For dragging, he favored the split-log drag, as it is commonly called, which consists of a plank with a steel facing in their particular case. The reason he favored this type of drag over the steel drag was that it did not cut into the surface of the road, an action which he believed destroyed the road. When it is necessary to cut the surface, a grader should be used, he stated. He was very emphatic on the point that dragging be done only after rains. In placing a gravel surface on the road, he advocated the application of two or three light coats of gravel surfacing, put on at suitable intervals, rather than one heavy surfacing, which would mean an impediment to traffic and an inferior road to that constructed on the other principle. He also spoke a good word for the use of dump trucks on road work, stating that a truck investment was about the best investment he knew. He gave several figures on cost of hauling with truck to substantiate this contention and in summarizing stated that they figured they had done about twice as much work at less cost by utilizing a truck for material hauling.

In closing he suggested that the paper read the previous day at the meeting of the Ontario Road Superintendents and Engineers, by Mr. H. Irwin, of the Highways Department, on "Township Road Organization," be repeated, as he stated he had never heard the subject covered in such an excellent manner as it had been stated by Mr. Irwin in his paper.

County Roads

On Thursday morning considerable discussion took place on the topic "What is Being Done by our Counties." The subject was first dealt with by G. R. Marston, county engineer of Norfolk, whose paper in this connection will be printed in full in an early issue.

Following the presentation of Mr. Marston's paper, L. M. Lapointe, of Prescott and Russell, outlined his experience in county road construction. The county system of road construction was incorporated in Prescott and Russell in 1917 and the county authorities have since been making experiments to determine the plan that they should follow in this work. They have tried both day labor and contract, and although the council was favorable at first to the day labor method, experience has shown that the contract system is the best plan. Mr. Lapointe remarked that Prescott and Russell had no gravel pits and were depending on limestone or field stone, the former being better on account of its superior binding qualities. In many cases the haul was as much as 10 miles. He stressed the importance of oiling the macadam roads for two or three years after construction, so as to reduce maintenance. Mr. Lapointe closed with a suggestion that the province be made responsible for maintenance in its entirety.

The discussion was continued by D. W. Walls, of Ontario County, who stated that in his particular municipality culverts and bridges were receiving the most attention so far and that in the matter of road construction, maintenance and the base course were being thoroughly looked after with a view to permanence of construction efforts.

Finance

In the afternoon, Hon. George S. Henry gave a brief address on road expenditure and its relations to total expenditure. Reeve Mason, of Townsend, continued the development of this topic, declaring that the money spent on roads was of more value to the farmers and their farms than new buildings and yet the amount of money devoted to roads is much smaller. Mr. Mason expressed the opinion that there are too many miles of county roads for proper financing and he also declared that the feeling was prevalent that taxes are high enough. He was followed by Mr. Richardson, who demonstrated that in 59 townships which he had investigated, roads and bridges comprised 28 per cent of the total expenditure while education was responsible for 39 per cent.

Federal Government's Responsibility

On the general topic, "Who Should Pay for Roads?" S. L. Squire took up the aspect of the subject that dealt with the federal government's responsibility. He pointed out that roads are not local in function, but are interprovincial and national and then demonstrated that the federal government makes direct use of one-third of the total mileage of the country in connection with its postal service and yet, while the receipts of this department are over $32,000,000 annually none is contributed toward roads. Roads also had a direct relation to colonization, according to Mr. Squire, and if the government were anxious to encourage the settlement of the country, he felt that they should contribute to the building of roads that will keep the settlers contented and give them access to their markets.

According to Mr. Squire, the government is also deriving considerable revenue from the automobile traffic in the way of customs duties on motors and accessories, taxes on automotive industries and similar items that amount to $20,000,000 per annum. The large part of this revenue was directly attributable to the fact that good roads increase automobile traffic and the government, therefore, had a certain responsibility in connection with road development. Roads also add to the country's credit and they further build up a united people, developing loyalty and a common understanding. These things are the business of the federal government and should be recognized by a contribution to road construction.

The Province's Responsibility

Mr. W. A. McLean followed with "The Province's Responsibility" in regard to the payment for roads.

"We are today drawing in automobile fees more than the entire income of the province when this association was formed" said Mr. McLean in opening his address, and we have a scheme which, in its organization, compares favorably with any country or state." In deciding upon a point to approach the subject, he said: "The unit of service is the vehicle mile. Your roads cost you in proportion to the number of vehicles going over these highways and their nominal charge for upkeep. The cost of construction must be, in a degree, in proportion to that charge. In my estimates of the distribution of traffic I have reached somewhat this result. The counties and the province are taking care of some 10,000 or 12,000 miles of highways and the townships are taking care of some 42,000 miles, and, while the township roads have about four times the mileage, yet the other highways are carrying four times the total volume of traffic on township roads. That is where the real charge for construction and upkeep comes in.

"One of the first duties of the province is to help municipalities to help themselves" he continued. "It is said that the Highway Department, in its effect, weakens the influence of municipal government in Ontario. If so, why have we here the biggest Good Roads Convention Ontario has ever had?" he asked. He went on to state that the Highways Department has strengthened the hand of municipal government in respect to roads and that it is the duty of that department to help the municipalities to help themselves, outlining the present system of co-operation in the financing of various road systems and justifying the methods practised in proportioning the payment for these roads.

He spoke in a general manner of the purpose of the highways systems in Ontario—the efficient linking up of the various roads to provide a complete system that would serve the best interests of its users throughout the province, correcting the old inefficient methods when roads were built within the counties to about two or three miles of the borders of the counties, providing no through roads from county to county. He cited an instance of this in the old Kingston road to Toronto. "As fast as we join up main roads the traffic is there to prove the necessity of it" he said.

He had no sympathy with the theory that we should sum up our expenditures on roads for a term of years. "If you were to figure up what it has cost you to live and bring up a family over a term of years, you would begin to realize that it was costing you too much" he argued, "and you would come to the conclusion that you couldn't afford to live. If we are to look at roads in the same manner, we shall reach the conclusion that we cannot afford to build them."

He referred to Mayor Maguire's remarks of the previous day as to the part Toronto has played during the past ten years or so in paying for roads outside the city limits and stated he was glad that it was Mayor Maguire that was proud of it. Figured out it amounted to an annual payment of about $150,000 a year, or 25 cents per head of population.

"Mud Tax"

A very good point brought out by Mr. McLean in his remarks was his reference to the "mud" tax. In this connection he said, "we have heard of taxes grown up with respect to roads, but there is one tax not spoken of which is not as heavy today as it was years ago Ontario has reached a stage when we can be proud of our highway system, but if we do not keep it up to standard, we will have to meet the "mud" tax. What has this cost Ontario? I do not know what it amounts to financially, but I do know it has cost the townships a good many men that should be on the farms and the country in general a good many men that should be here, but are in the States."

In reviewing expenditures on the system, he pointed out that slightly over half the total expenditure had been charged to the province of Ontario. The cost of the past few years could not be determined as representative as these where what he termed years of emergency. "We will soon have 1,800 miles of splendid road in Ontario to meet the demands of traffic" he stated. "All culverts will be installed by the end of the year and practically all the bridges of importance on the system will be erected by that time. The paving near cities will be largely overtaken and there will be only the intervening sections where traffic is light and paving in the outer sections of the system which will not require paving for years."

His concluding remarks were "broadly, our fundamental idea in the provincial scheme is to help the townships to help themselves; to help the counties to help themselves and to step in wherever organization is required to take care of heavy traffic. That is the scheme most effective in countries of good roads and is the only scheme that will bring good roads to the province of Ontario."

Municipal Responsibility

Mr. Campbell, city engineer of Belleville, Ont., spoke in the absence of the gentlemen programmed to talk on "Municipality Responsibility." He read a paper which he had prepared as an expression of the sentiment of several municipal representatives at the convention on the above subject. In this the opinion was expressed that there should be a fourth classification of roads coming under the provincial grant, namely those lying wholly within the cities, which might be termed urban highways. There was an objection raised, too, to the assessment for a portion of the cost of highway construction and maintenance outside the cities, bringing out the point that in this connection there were several cities, ranging in population from 20,000 to 30,000, who were assessed on the same basis as the larger city of Toronto, for instance. Another point thought unfair was the payment of automobile license fees and police fines to the provincial treasury. It was also pointed out that the rural population make considerable use of the roads within the cities and yet are not taxed with any of the cost. Messrs. Wilcox, Wall, Talbot and Zieman took part in the discussion following this paper.

Mr. Mahoney was another member who was not deeply impressed with the part the city of Toronto has taken in the construction of roads and he also referred to Mayor Maguire's talk of the day before on this point, indicating that several of the roads on which this money had been spent by the city during the past 11 years had probably been taken into the city within that time. Dealing with the subject in a general way, he said that good roads had enabled the cities to transport their products at less cost and as the cities benefitted they should share in the payment. He contended that the ever increasing tourist traffic over highways directly benefits the cities, the outlying districts receiving very little of the business resulting from this class of traffic. In the city, too, he pointed out, the citizens pay only on the small section of road directly in front of their property, while the people in the more sparsely populated districts pay on a much larger section of road.

Mr. Richardson followed with a few remarks along the same line. He stated the locaton of hghways had been determined by the cities and they have all the best of the argument and therefore should pay their share.

This brought to a close the second day's proceedings. In the evening the delegates were entertained at a banquet in the King Edward Hotel.

Traffic Laws

Mr. M. M. McBride, Labor member for Brantford, Ont., was the chief speaker at the morning session on Friday, the subject under discussion being Highway Traffic Laws. In connection with the point of protection to the public with relation to travel, he stated that the committee appointed at the last session of parliament, to gather information for the revision of the Motor Vehicles Act, met with a great diversity of opinion among the people regarding the proposed revisions.

"In providing safety" said Mr. McBride, "we might make laws for the next 100 years and not accomplish as much as your own common sense. The man driving the vehicle, if he wants to eliminate accidents, must depend on his own common sense." Both the driver of the vehicle and the pedestrian had their rights, he continued, and the safety of the public and the elimination of accidents must depend to a great extent on the judgment of the man behind the wheel. The solution of the problem, as he saw it, lay in education and he commended the work of the Ontario Safety League in this connection. "Our problem, and more particularly your problem," he said, "is first of all to eliminate the possibility of accidents. I am sure we can do this if we get the united support of the best people of our province." In concluding he referred to the huge investment in highways and predicted that in five or ten years they would be satisfied that it was the best investment ever made. No matter what government is in power, he said, he felt sure there would never be any difference of opinion in the matter of providing money for highways.

In the discussion following Mr. McBride's talk, the matter of danger to pedestrians on main trunk highways, such as the Toronto-Hamilton highway, was brought up and the suggestion made that on these types of roads the province should also lay a sidewalk for the safety of the pedestrian traffic. The matter of enforcing all vehicles to carry lights was also discussed. The general opinion seemed to be that the enforcing of such a measure on the farmers would be a hardship. In the more thickly populated districts it was, perhaps, justified, and the cities under present legislation are vested with the right to enforce this rule, but several speakers did not favor making it a government measure applying to the entire province. It was thought that in time the matter would be worked out satisfactorily by evolutionary education.

Copies of a new bill incorporating amendments to the Motor Vehicles Act, the Load of Vehicles Act, and the Highway Travel Act were distributed to the delegates. The Bill has passed its second reading.

Resolutions

The chairman then announced that the meeting would be brought to a close with the morning session, as several of the members had indicated their intention of leaving at noon. He called for the report of the Resolutions Committee, which read as follows:

Extension of Federal Act

That this Association places itself on record as approving the principle of Federal Aid to Highways, together with an extension of time to such provinces as will be unable to take full advantage of their appropriation within the time limit.

And that we heartily support the Canadian Good Roads Association in its efforts to obtain a further grant to the various Provinces.

Cost of Provincial Highways

Whereas it is the opinion of the rural and urban municipalities of this convention that the basis of assessment of costs of construction of the Provincial Highways, as now in force under the Provincial Highways Act, is unjust to the said municipalities.

That we recommend an immediate survey be made by the provincial government of provincial highway road cost distribution for the purpose of securing a more equitable assessment of such costs.

And that the Ontario Good Roads Association be allowed representation on such committee.

Toronto - Hamilton Highway

That the municipalities lying between Hamilton and Toronto who have subscribed towards the building of the first concrete pavement known as the Toronto and Hamilton Highway, and as it has proven such a success that the Honourable F. C. Biggs, Minister of Public Works and Highways, who was a member of the County Council of Wentworth at the time of construction, has gone on, through his good judgment, and designated the roads from Toronto to Montreal and from Hamilton to Windsor as Provincial Highways:

Be it therefore resolved that we petition the Honourable Mr. Biggs and the Government to take over that portion of the highway lying between Toronto and Hamilton as a Provincial Highway, completing the Provincial Highway from Windsor to Quebec Border.

County Roads

Whereas under the county good roads system as at present authorized, the cost of construction must be apportioned rateably over the entire county.

And whereas the amount of yearly construction of county good roads must be restricted to construction of the most urgent nature, having reference to the immediate requirements of the County as a whole.

And whereas many instances are occurring where resident ratepayers on certain roads are desirous of improving their road in order to have a construction of a more permanent nature, and are willing to pay an increased portion of the cost of constructing the same, so as to enable the desired improvement to be undertaken.

Now therefore be it resolved that this Ontario Good Roads Association now in session, do urge upon the Government the desirability of amending the Municipal Act, so as to admit of part of the cost of construction of county highways being undertaken on a system of local improvement assessment.

Change in Local Improvement Act

Whereas under the local improvement act, no provision is made for the assessment of local improvements except on a frontage basis.

And whereas occasions are arising in township municipalities where residents of localities are desirous of improving the condition of the roads in their respective localities by the issue of short debentures

Now whereas other conditions are arising, where it would be more equitable, and where the resident ratepayers are desirous of having the assessment of such local improvement made on a basis of the area or other equitable manner, of the property in the locality.

Now therfore be it resolved that this Ontario Good Roads Association now in session do urge upon the government the advisability of amending the local improvement act so as to permit the assessment of local improvements being made on a basis of the area of the property in the locality affected by such local improvement, or other equitable manner, in the cases where the same would be more equitable than assessment on a foot frontage basis.

Disapprove Trans-Canada Highway

That whereas this association is very much and vitally interested in highway improvement in Ontario.

And whereas there is a great and increasing demand for more and better roads in the settled districts of this province.

And whereas this is a time for rigid economy in public expenditure.

It is hereby resolved that this association go on record as disapproving of the expenditure of any public money on a so-called Trans-Canada Highway at the present time where the building of any portion of such road is not warranted by local traffic.

And that moreover we place ourselves on record as favoring the expenditure of money for road improvement in districts where there is an immediate need of same for agricultural and industrial purposes

The Nominating Committee brought in their report, showing the following new officers for this year: Honorary presidents: T. J. Mahoney and W. H. Brown; president, John Currie; first vice-president, Hon. Geo. S. Henry; second vice-president, Alvin Rose; Directors, Messrs. Peter Ray, J. E. Jameson, H. Drumgole, F. A. Senecal, Johnson Hannah, W. H. Nugent, Fred Richardson; secretary-treasurer, Mr. S. L. Squire.

This brought to a close the most successful convention the Ontario Good Roads Association has ever held. The registration was slightly over 500, packing the large convention hall at every session.

Pedlar People Hold Annual Convention

Branch managers and sales representatives from all parts of Canada recently gathered for the annual convention of the Pedlar People Limited at the company's head offices, Oshawa, Ontario. The convention took the better part of a week and many matters connected with the building and general construction industries were discussed by men who are intimately acquainted with conditions in every section of the Dominion.

A feeling of conservative optimism prevailed throughout the various conferences and it was general consensus of opinion that 1923 would prove a banner year for sheet metal goods. The extensive programs of construction and road building which are contemplated in the various provinces of Canada this year will unquestionably create a vigorous demand for sheet metal products and every branch manager and salesman present at the convention took care to stress the claims of his particular territory for good treatment on the part of the head office and factory executives.

Fortunately, the plant of the company is equal to almost any conceivable degree of expansion in demand, so that the branch offices may rest assured—as it was pointed out by the head office authorities—of prompt and efficient attention to their demands. The company's products include metal lath, Toncan metal culverts, steelcrete, low rib metal roofing and siding, rib fabric, Saino firedoors and several other sheet metal products of interest to architects and engineers, besides automobile body stampings for widely-known makes of cars.

One evening was devoted to a banquet tendered to the visiting representatives by the head office executives. President W. R. Geikie genially filled the role of chairman and toastmaster. Several brief addresses were given, including one by the general sales manager, W. E. Clarke, who outlined the well-ordered plans which the company has laid down to help the entire staff realize their expectations for the biggest year yet. We reproduce a group photograph taken outside the company's general offices, showing those who attended the convention.

Hamilton Bridge Works Open Office in Toronto

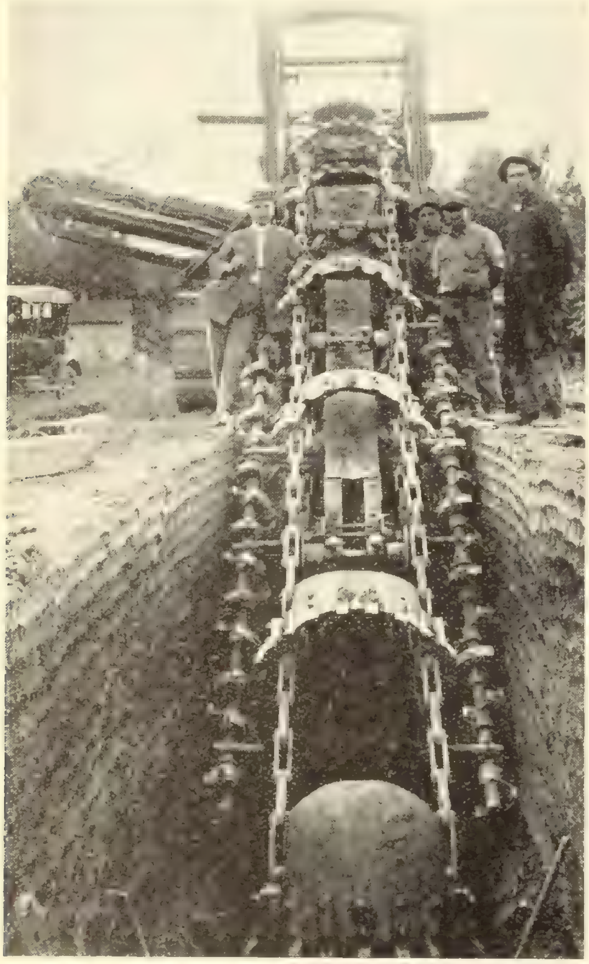
The Hamilton Bridge Works Co. Ltd., have opened an office in Room 410, General Assurance Building, corner of Bay and Temperance Streets, Toronto. This office will be in charge of Mr. N. LeRoi Crosby, as district representative. Mr. Crosby is a graduate of 1905 in civil engineering, University of Toronto, and has had wide experience. His record includes 6 years with the McClintock-Marshall Company of Chicago sales office and ten years, with the Toronto Pittsburgh, half of which, time was spent in their Steel Construction Company.

Pedlar People's Convention

New Machinery for the Road Builder

New Buckeye Auxiliary Cutter Gives Range of Trench Widths

A new trench excavator attachment, by means of which the cutting range of Buckeye excavators is greatly increased without changing the buckets has been perfected by The Buckeye Traction Ditcher Co., of Findlay, Ohio. The new rotary auxiliary cutter, as the device is called, makes it possible to cut, with one machine, trench widths which would formerly have required two different models, thus increasing the variety of trench work on which the average contractor can afford to bid.



The Buckeye auxiliary trench cutter

The value of this new device is indicated by the new cutting widths now possible with various Buckeye Models For instance, the Model-C-10 now has a range from 24 to 48 in. the C-15, from 24 to 60 in., and the C-20 from 40 to 76 inches.

The new Buckeye auxiliary cutter is simplicity itself. It consists of two shafts, one on each side of the boom. Each shaft is fitted with steel cutting teeth. As the shafts revolve, these teeth dig into the trench side walls outside of the buckets, giving an extra cut on each side. The shaft supports are adjustable, permitting variation of cutting widths as desired.

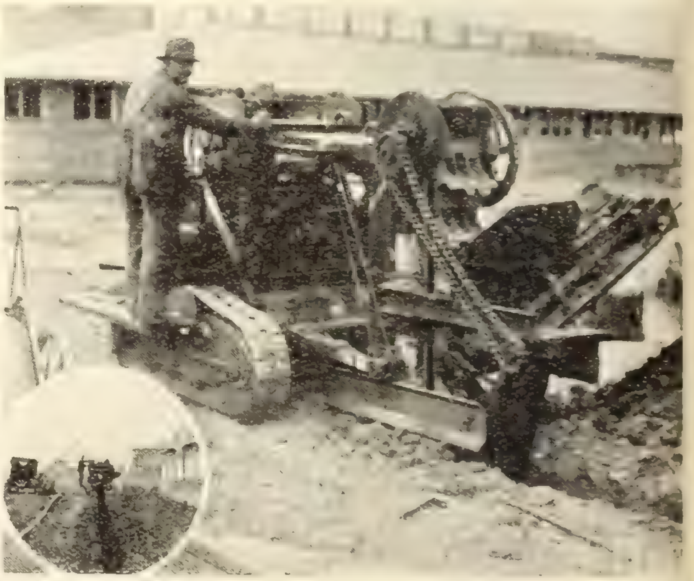
No additional power is required as the auxiliary cutters take the load off the regular bucket side cutters. Power is transmitted by heavy steel roller chain operating from the shaft that drives the digging buckets. Four men, in two hours, can attach or remove the rotary auxiliary cutter, which can be used with any Model C Buckeye excavator.

Small Ditcher with Vertical Boom

With a vertical boom which digs straight down and a positive discharge busket a new ditcher has been brought out by the Barber-Greene Co., Aurora, Ill. It will dig to a depth of five feet and to a width of either seven and one-half inches or fifteen inches Digging speeds can be changed to suit varying conditions, but under favorable conditions, the machine will dig a fifteen-inch ditch four feet deep at the rate of three feet per minute.

This type of boom construction permits the operator to dig close to obstructions, to turn corners, or even dig post holes with it.

Practically any kind of material can be dug with this ditcher. It is equipped with buckets of special design that break as they pass over the head sprocket.



Barber-Greene vertical boom ditcher

This insures clean buckets and positive discharge even where clay is handled.

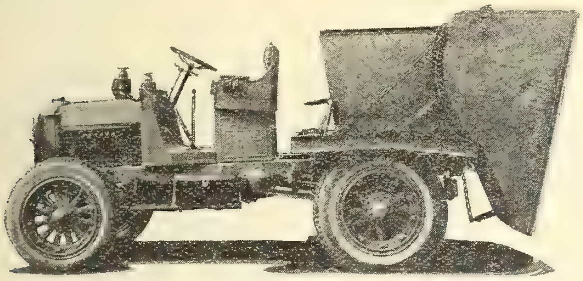
Although this is a newly designed machine, many of the units are already well tried. For instance, it is mounted on the standard chassis which carries the Barber-Greene self-feeding bucket loader. The Buda engine and the Cotta transmission are also the same. The bucket loader boom is interchangeable with the ditcher boom, as either can be mounted on the same chassis.

The digging boom is quickly raised by means of a power hoist to permit the ditcher to pass large stones, pipes, etc. The discharge can be shifted from side to side in the field.

A fast travelling speed makes it possible for the machine to move quickly from one job to another. It may be moved at either 36 feet, 72 feet or 144 feet per minute. A reverse speed of 42 feet per minute is also available.

Short Wheel Base Motor Truck for Road Work

The illustration herewith shows the most recent development in "Federal" trucks. A remarkable feature of this truck is that it has a short wheel base—only 86 inches. It is thus specially valuable for general highway road work and pavement construction, where the short wheel base is of great importance on accout of narrow roads or restricted areas. The truck is equipped with a dual one-yard end-dump body and can be used either to supply measured batches or to place mixed concrete from central mixing plants. These trucks are being distributed from Toronto, by Jones Motors, Limited.



Federal Motor Truck Co's 86" wheel base truck

Trucks Specially Adapted for Road Construction Purposes

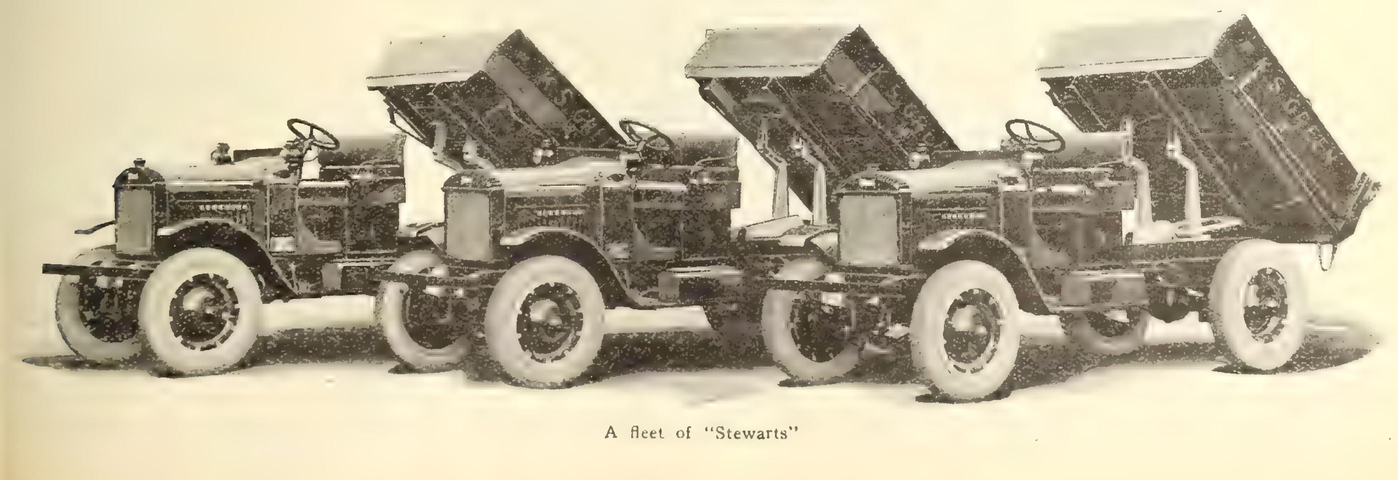
The Stewart Motor Corporation, of Buffalo, New York, have recently designed and perfected a chassis and body particularly adapted for contracting and road building work. This is made in a 2½ to 3 ton chassis with 2 cu. yd. body and also in the 3½ to 4 ton chassis with 3 cu. yd. body. On the 2½ ton chassis the wheelbase is 120 inches with remarkably short turning radius. The chassis can be equipped with either pneumatic or solid tires. Note from the illustration that the body is comparatively low with approximately 40% of the total load carried on the front wheels. The body is equipped with an hydraulic hoist, having center swinging partition by the driver. Every hoist, body and chassis is tested for maximum load before being shipped from the factory. Another feature of this truck is that two different kinds of material can be loaded at once. Arriving at the mixer, the discharges can be made in one backing operation. Each compartment is dumped as fast as the mixer can handle it. The Stewart Motor Corporation has been building trucks for over ten years, and their trucks are in use today in over forty-one countries of the globe. "Stewarts" are handled and serviced in Toronto and Winnipeg by Commercial Cars of Canada, Ltd.

Small Semi-Portable Dragline Material Handling Equipment

For gravel or sand pits where only a few thousand cubic yards of material are to be handled in a season the expense of a standard cableway equipment is not generally justified. For this reason a "Junior" cableway of a semi-portable nature has been brought out by Sauerman Bros., Chicago. This plant, being equal to standard cableways in design and construction but cheaper, lighter and more readily moved, will prove profitable on temporary jobs or on work where a small amount of material is to be handled. Road contractors, for example, will find such an equipment satisfactory for their requirements.

This type of cableway consists primarily of a scraper bucket attached by flexible chain connections to a carrier running on an inclined track cable, this cable being supported at the upper end by tension blocks to a well-guyed mast and anchored at the lower end to a bridle anchorage. A load cable is attached to the front of the bucket and carrier. This cable performs the operation of loading the bucket and conveying it along the track cable to the dumping point. A tension cable is provided for operating the tension or fall blocks at top of mast. This cable and the blocks tighten and slacken the track cable. Both the load and tension cables lead from guide blocks at the top of the mast down to the drums of the hoist.

The machine, which is operated very simply by one man, will span a large area and excavate, convey and elevate the material to the dumping point without the use of any intermediate machinery. It is



A fleet of "Stewarts"

claimed to be equally satisfactory whether working under water or in the dry, and will dig to the full depth of any ordinary gravel deposit.

The makers state that the bucket digs a full load in a few seconds, is hauled in to the dumping point at a speed of 300 ft. per minute and is rapidly elevated as it travels by the raising of the track cable, is dumped automatically at the desired point without resource to latches or complicated tripping devices, and is returned to the digging point by gravity. As a good part of the cycle of operation is accomplished by gravity, the power consumption is small.

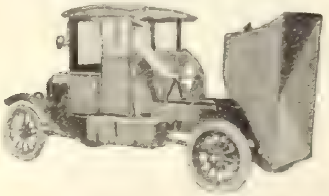
Sauerman "Junior" Cableway

Water Ballasted Road Roller of Gasoline Type

The road roller illustrated herewith is the latest model, manufactured by Barford and Perkins, Ltd., Peterborough, England. This is a three wheel gasoline engine driven roller with scarifier, weighing ten tons empty. Water is used for ballast by which the weight can be increased to thirteen tons. All three wheels are designed to contain ballast. This company's products are distributed in Canada by Edward O. Herbert, 81 Walnut Street Winnipeg, Man., who recently delivered two similar rollers to the Dominion government to operate on their roads in the Rocky Mountains and on the Banff-Windermere highway. The roller illustrated is equipped with a 40 h.p. motor adapted to use either gasoline or coal oil and operates at a speed of 900-1,000 r.p.m. The centre of gravity is extremely low as the sub-frame carrying the engine, gear box and transmission is underslung. The wheel base is short enabling the roller to turn within a circle of 16 ft. radius. The consumption of gasoline is five to seven gallons per day. One special feature is the high pressure per inch that may be obtained, 443 lbs. being the minimum and 513 lbs. the maximum.

Automatic Dump Bodies Cut Costs

During the past season of busy construction work many contractors have been asking themselves this question. Is my hauling equipment giving me the utmost in economic and efficient delivery of my materials? So these contractors have investigated the new ideas along this line and have found that, measured on a basis of cost per hour per ton mile, the smaller trucks equipped with automatic dump bodies have been the answer in their particular case.

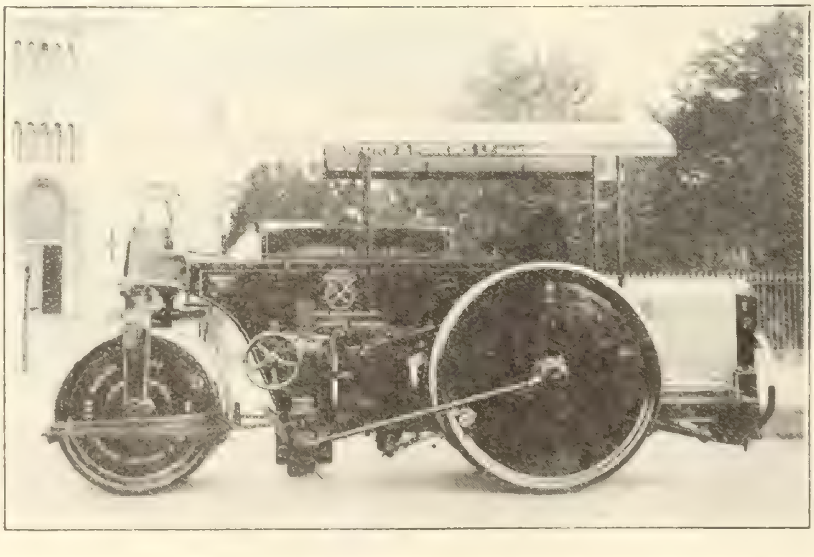


Automatic Dump Body

Dual hopper automatic dump body

Bodies of this type are being made in Canada by the Dominion Truck Equipment Company, Kitchener, Ont., and contractors who have used them state that they have not only reduced their hauling and mixing costs from 40% to 50% but have also greatly increased the amount of yardage laid.

The handling of cement, sand and stone on concrete paving work, should receive the contractors greatest personal attention. Tremendous savings may be affected by means of proper plant and organization. This is true whether the paving in ques-



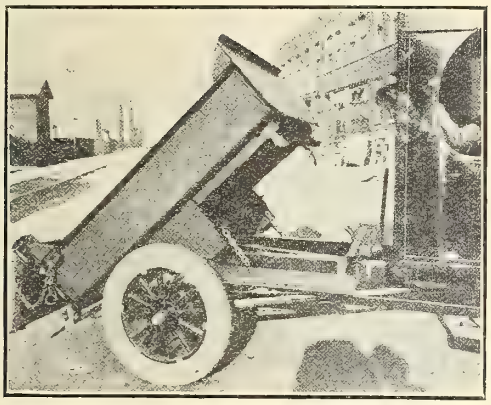
A water-ballasted road roller made by Barford and Perkins Ltd., of England. (Handled by E. O. Herbert, Winnipeg.) Has high pressure per inch. Will run on gasoline or coal oil.

tion is a true concrete pavement or whether it is the base course of concrete for a brick, asphalt or block pavement. It is true also whether the job in question is a country highway or city street.

Following is a brief explanation of the two methods commonly used.

1. **Dry Aggregate Method**—Materials are usually delivered by cars or otherwise to some central storage plant where they are stored in bins or piles. If possible this central plant is located approximately half way along the pavement which is to be laid. The charge of gravel, sand and cement is loaded into the body at the storage bins, carried to the paving machine on the roadway and dumped directly into the mixer skip without rehandling.

Wet Mix Method—With this method the materials are mixed at a central mixing plant with a stationary mixer. The mixed concrete is hauled and deposited just where it is needed on the job. The length of the haul must not be greater than a truck can run in thirty minutes; otherwise the concrete will set. But light trucks will run from six to ten miles in 30 minutes. Owing to the steep dumping angle (70 degrees) of Dominion hopper bodies the whole load is dumped cleanly upon the ground.



"Dominion" end-dump body

The single end dump hopper body is made of No. 10 gauge sheet metal. The sub-frame is of standard structural steel shapes. Riveting, both on hoppers and sub-frame, is of special importance and is the secret of a long lived and durable body. For this reason all parts are joined with large sized rivets driven hot. Single hopper bodies are made in sizes from 1 to 3 yard capacity.

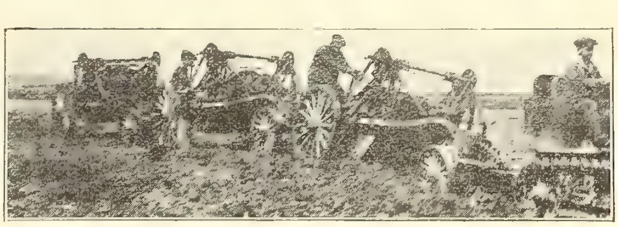
The dual hopper type is similar in construction to the single hopper but each hopper can be dumped separately and the truck on which they are mounted can carry two full charges for the mixer skip. Dual hopper bodies are made in sizes from ½ yard up to 1½ yards for each hopper.

Another type of body which this firm is bringing out is the Dominion utility end-dump body. It is a dump and express body in one. It hauls anything, dumps without power and has no hoist. By pulling a lever the body rolls over and dumps and the end gate opens automatically. The driver does not need to leave his seat. This general purpose dumping body is especially useful because of its low shovelling height. This body is made in capacities from 1 to 5 cubic yards and the capacity of each individual body can be increased by the use of side boards. Where an all purpose body is needed these bodies can be provided with stakes, giving a dump, express and stake body in one.

The different types of bodies herein described are manufactured by the Dominion Truck Equipment Co. Ltd., Kitchener, Ont., to suit every make of truck.

Scraper Trains Move 400 Yards per Day

The Baker Manufacturing Company of Springfield, Ill., claim that their scraper trains can move from 300 to 400 yards of dirt per day. These trains contain 2, 3, 4, 5 or 6 scrapers, operated by a tractor and requiring only two or three men. The scrapers are self loading, four wheel, and contain one cubic yard each.



Scraper trains move 400 yds. per day

Trade Publications

Sauerman Junior Cableway—Sauerman Bros., Chicago, in a 4-page folder describe and illustrate a new dragline excavator that is especially intended for small propositions where a small volume of material is to be handled.

A New Ditcher with Vertical Boom—Barber-Greene Co., Aurora, Ill., have issued a 4-page folder descriptive of a small ditching machine of the vertical digging, side discharge type. It is operated by a 25 h.p. gasoline engine.

6-H Little Tugger Hoists—The Canadian Ingersoll-Rand Co., Montreal, in an 8-page booklet give a full description of the use of the "Little Tugger" hoist with a scraper for mine slushing. The specifications of the machine are detailed and its advantages outlined.

Air-Line Lubricators—A device that automatically furnishes a supply of lubricant to rock drills by atomizing the oil and mixing it with the air stream is illustrated and described in a leaflet issued by the Canadian Ingersoll-Rand Co., Montreal.

Cameron Centrifugal Fire Pumps—The Canadian Ingersoll-Rand Co., Montreal, in a 4-page folder describe the Cameron fire pumps of the single-stage, double suction, volute centrifugal type.

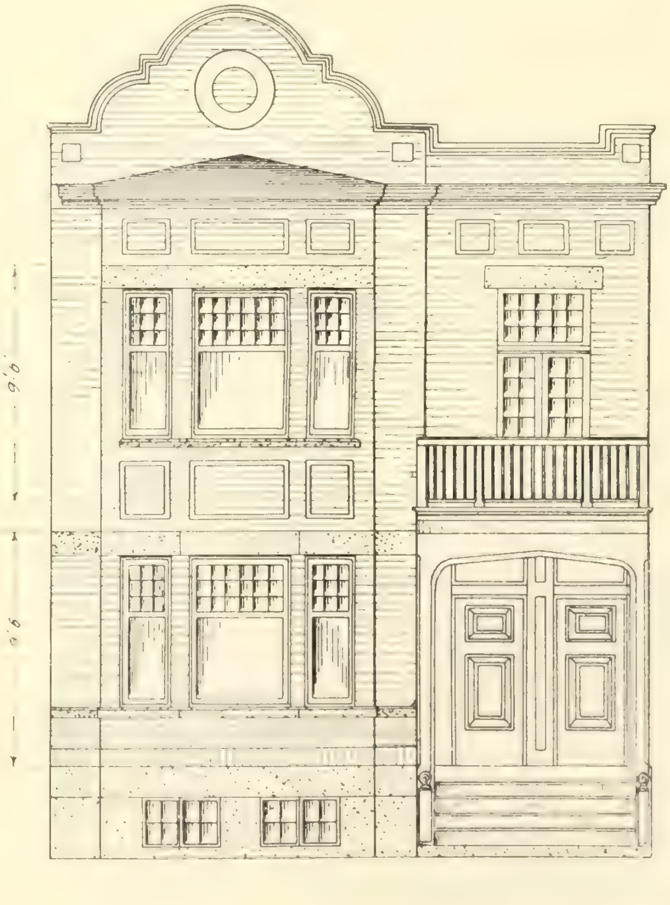
Cameron Boiler Feed Pumps—An illustrated description of the Cameron centrifugal, double-suction, volute, turbine driven boiler feed pumps is given in a folder issued by the Canadian Ingersoll-Rand Co., Montreal.

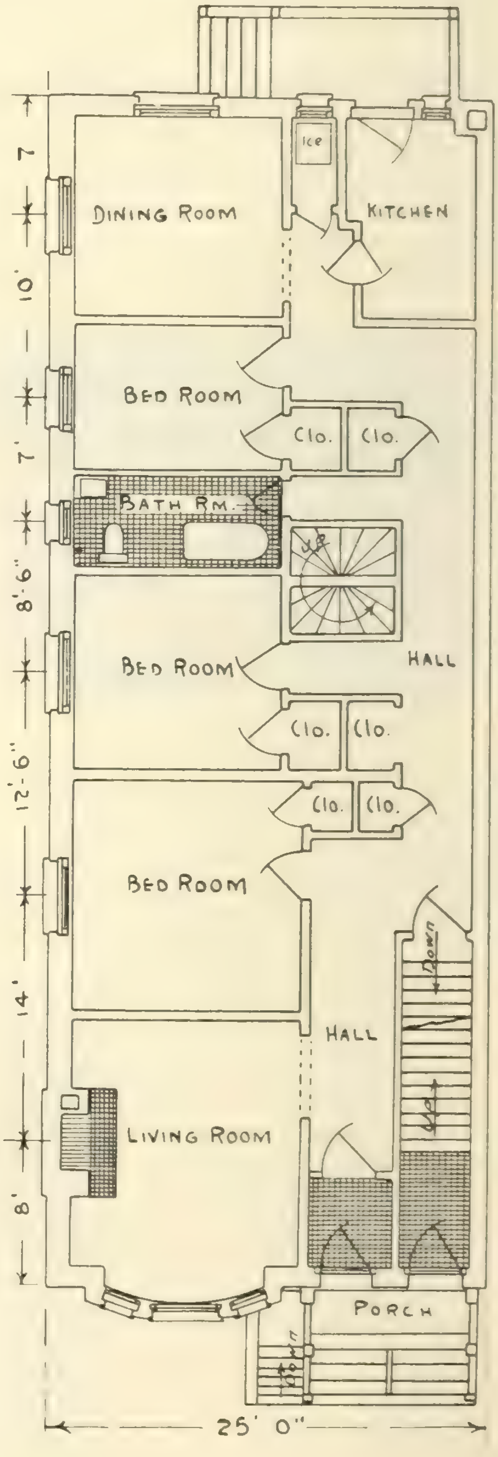
"DriAir"—The Canadian Ingersoll-Rand Co., Montreal, in a 4-page folder, gives details of a device for separating and discharging water from compressed air lines, thus providing dry air. The New Jersey Meter Co., Plainfield, N.J., are the makers of the device.

The Contract Record's

Weekly House Suggestion No. 59

The house illustrated in this week's issue was designed by Mr. M. L. Belmont, architect of Montreal, and was built for $12,000.00. The house comprises two apartments and measures 25 by 67 feet. The lower floor contains six spacious rooms, three of which are provided with closets. There are also two wardrobes in the hall. The upper floor divisions are similar to those of the ground floor with the exception of a small living room at the front above the hall. Each apartment communicates to the cellar through independent stairways. There is a natural fireplace in each of the two larger living rooms. There are verandahs at the front of the house and at the rear. The floors are made of cherrywood and all interior woodwork is finished in chestunt and British Columbia fir. The floors of the vestibules and the floors and walls of the bathrooms are finished with tile. Each apartment has its own hot water heating system, and a cold room.





CONSTRUCTIONAL ACTIVITY

Period of Feb. 28 to March 6, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Alexandria, Ont.
Town Council contemplates a cement sidewalk costing $1,200. J. Laurin, Mayor.

Cacouna, Que.
Town Council of Cacouna is in the market for a fire pump, and want prices, catalogues, etc. U. Michaud, secretary.

Cloverdale, B. C.
Provincial Government contemplates the paving of the Pacific Highway from Cloverdale to Blaine at a cost of $250,000. Hon. W. H. Sutherland, Minister of Public Works, Victoria.

Eastview, Ont.
Town Council will purchase pipe for proposed waterworks in the open market about May 1. F. St. Armour, reeve.

Fonthill, Ont.
The council has retained the services of James, Proctor & Redfern, consulting engineers, Toronto, to prepare a report and estimate on the cost of installing a waterworks system.

Ford, Ont.
Ford Motor Co. is building a tunnel and storm sewers. Wells & Gray Ltd., Windsor, general contractors.

Hamilton, Ont.
City Council contemplates the widening of corner of King & William Sts. E. R. Gray, engineer.

Leamington, Ont.
Sewage disposal plant proposed by the Town Council. Reeve Smith is a member of the committee investigating the matter.

Moncton, N. B.
City Council contemplates permanent pavements to the extent of $75,000. J. Edington, engineer. S. B. Anderson, clerk.

Ottawa, Ont.
Tenders for asphalt plant equipment will be received by the Board of Control until Mar. 13. C. F. Macullum, Commissioner of Works.

Port Perry, Ont.
The Town Council contemplates adding a gasoline engine and pump to the fire equipment.

St. Andrew's, N. B.
Tenders for pipe, man hole frames and covers are being received by the sewer Commission until Mar. 12. MacKenzie & Armstrong, Woodstock, N. B., engineers.

Sydney, N. S.
Improvements to the waterworks contemplated by the City Council will cost about $80,000. Ronald McKinnon, Engineer.

Toronto, Ont.
City wants tenders on a centrifugal sludge pump and motor, 3,000,000 imperial gallon capacity. Tenders will close April 10.

Waterloo Co., Ont.
Tenders are wanted by the County Council until Mar. 15 for a concrete road. S. Cassels, Court House, Kitchener, clerk.

CONTRACTS AWARDED

Province of Ontario
Provincial Government has awarded contracts for 1923 roadwork as follows: 796 & 860—D. O. Johnston, 43 Market St., Brantford; 797 & 921—Dufferin Construction Co. Ltd., 210 Victoria St., Toronto; 863 & 948—Brennan Paving Co. Ltd., Melrose Ave., Toronto; 864 & 982—Provincial Paving Co., 24 Adelaide St. W., Toronto; 798—Standard Paving Co., Central Chambers, Ottawa; 799—W. H. Patterson, 211 Dufferin St., Belleville; 804—Belanger & Walsh, L'Original, Ont.; 802—J. E. McDonald, Dundas St., Whitby; 803—Belanger & Walsh, L'Original; 807 & 810—National Tar Co., c/o Jas. Mulligan, 130 Laclie St. N., Orillia; 815—J. J. Dewhearst, Wardsville, Ont.; 820 & 822—Ontario Bridge Co., Crown Office Building, Toronto; 826—T. Manley, 65 Charles St., Belleville. Balance of contracts to be let shortly.

Whitby, Ont.
Contracts on the slow sand filter awarded as follows: Cast Iron Pipe and Specials, National Iron Corporation, Toronto; gate valves, T. McAvity & Sons, St. John, N. B.; sewer pipe, Jake McIntyre, Whitby; turbine equipment, Turbine Equipment Co. Ltd., Toronto; screens and structural steel, McGregor & McIntyre, Toronto; sand washer, John Inglis Co., Toronto; F. W. Thorold, 54 Admiral Rd., Toronto, engineer.

Railroads, Bridges and Wharves

Brantford, Ont.
Tenders have been called, closing on Mar. 24 for Lorne Bridge, costing $335,000. Tenders to be for complete job but made as folows: (a) Erecting new structure; (b) Removing the existing steel bridge; (c) Erecting temporary bridge; (d) Erection of that portion over the L. E. & N. Railway tracks.

Cap de Madeleine, Que.
A crib wharf extension costing $60,000 contemplated by the Dominion Government. R. C. Desrochers, Parliament Buildings, Ottawa, secretary. J. B. St. Laurent, Ottawa, Ont., is the engineer.

Kingston Parish, N. B.
Tenders will be received until Mar. 14 for a concrete arch culvert and road embankment, by the Provincial Department of Public Works.

Sydney, N. S.
City Council contemplates replacing several wooden bridges with concrete structures. Roland McKinnon, engineer.

Construction of a concrete bridge, costing $4,500, will commence shortly. R. McKinnon, engineer.

Three Rivers, Que.
Three Rivers Harbor Commission contemplate wharf conveyors costing $100,000. A. D. Swan, Birks Bldg., Montreal, consulting engineers.

Tenders will be called in April by the Three Rivers Traction Co., St. Maurice St., on street railway to cost about $100,000.

CONTRACTS AWARDED

Millhaven, Ont.
The Dominion Government has awarded the general contract for a wharf to W. D. Widmer, Napanee, Ont.

Public Buildings, Churches and Schools

Belleville, Ont.
W. H. Patterson, 211 Dufferin St., Belleville and R. Taylor, 90 Powell Ave., Ottawa, are submitting bulk tenders for the extension to Albert College.

Cabano, Que.
Work has just started on a church costing $100,000, Geo. Dube, Cabano, general contractor. Rev. J. B. Cyr, priest.

Cayuga, Ont.
Tenders on Haldimand County Court House and Jail will be received until March 14. F. Barber and Associates, 40 Jarvis St., Toronto, Ont., architects.

Fredericton, Ont.
Congregation of the Methodist Church contemplate adding a class room to their building about $20,000, Rev F. H. Holmes, King st., minister.

Grande Linge, Que.
Private tenders will be called immediately by S. Coomber, 127 Stanley St., Montreal, architect, for a gymnasium and workshop for the Feller Institute.

Montreal, Que.
Hugh Vallance, 128 Bleury St., has prepared sketch plans for an addition to the School for Crippled Children. Cost will be about $16,000.

Newly formed parish contemplates a church which may be built this spring. Rev. A. Gratton, Lachute, Que., interested.

Tenders are wanted by the Protestant School Board until Mar. 15th for an addition to Rosemount School. D. R. Brown, 285 Beaver Hall Hill, architect.

Ottawa, Ont.
City Council has received special legislation to proceed with a $30,000 fire station. R. Burnett, Fire Chief.

Plans for the $150,000 addition to the archives have been prepared by R. C. Wright, Hunter Bldg. R. C. Desrochers, Parliament Buildings, secretary.

Peterborough, Ont.
St. Lukes Episcopal Church is having plans prepared for an addition to the Sunday School at a cost of $6,500. W. H. Bary, 332½ George St., will call tenders soon.

Port Dalhousie, Ont.
Tenders are wanted for alterations to the Public School. W. Beaton, secretary.

Regina, Sask.
Provincial Government contemplates two tuberculosis sanitoria within the next two years at a cost of $300,000. Deputy Minister of Public Works, J. M. Smith.

Riviere-du-Loup, Que.
Pierre Levesque, 115 St. John St., Quedec, is preparing plans for a $20,000 addition to St. Francois-Xavier School. Contract will be let in April.

St. Alphonse, Que.
M. Lamontagne, Chicoutimi, is the architect preparing plans for the proposed $150,000 church. Parish has not yet decided definitely on building.

St. Boniface, Man.
Plans for the new $150,000 school for the Boniface School Board are being prepared by Geo. Northwood, 617 Union Bank Bldg., Winnipeg.

St. Catharines, Ont.
Nicholson & Macbeth, architects, 46 Queen St., will shortly call for tenders on the registry office for Lincoln County Council. Architects require data on metal doors, trim steel, sash and vault doors, metal rolling shutters and finished floor material.

Sault Ste. Marie, Ont.
The Presbyterian Church contemplates a mission costing $6,000. F. K. Allen, 48 Grace St., and R. E. King, 20 Salisbury St., interested.

Sydney, N. S.
Tenders will probably be called shortly on a $15,000 detention home by the City Council. J. J. Curry, clerk. F. L. Dixon, Brookland St., architect.

Sydney Twp., Ont.
W. J. Johnson, 32 Earl St., Belleville, has prepared plans for a school costing $7,000. Tenders will be called shortly.

Toronto, Ont.
Tenders will be called about Mar. 19 by the Board of Control for a reception hospital. C. A. Maguire, chairman.

Rev. J. J. Bennett, 83 Pendrith St., pastor, will receive tenders on laying 125,000 bricks for the Advent Christian Church until Mar. 19.

Tenders may be called this year for Church of the Holy Name. Father M. Cline, 9 Morcow Ave., rector. A. W. Holmes, 79 St. Joseph St., architect.

Waterloo, Ont.
J. M. Cowan, 991 Bay St., Toronto, Ont., is receiving tenders until Mar. 12 for a $70,000 addition to the Separate School. Ed. Dehler, secretary.

Winnipeg, Man.
Plans are being prepared for an eight room addition to a school. R. H. Smith, secretary of the School Board. Col. J. B. Mitchell, Commissioner of School Buildings, Winnipeg, architect.

Woodstock, Ont.
City Council contemplate an addition to the hospital on which work will start shortly. Sproatt & Rolph, 36 North St., Toronto, architects.

CONTRACTS AWARDED

Montreal, Que.
Lumber for the Pathological building being built for McGill University supplied by Abel Fortin Ltd., 383 Desjardins St. Contract for electrical work awarded to Canadian Comstock Co., 10 Cathcart St.; Garth & Co., 28 Craig St. W., have the plumbing and heating contract while R. D. Clark & Sons are doing the plastering.

Quebec, Que.
Quebec Provincial Exhibition Commission, City Hall, has awarded the general contract for the Industrial Palace to C. Emile Morissette, Ltee., 236 Latourelle St., at $88,161. The contract for structural steel has been awarded to Eastern Canada Steel & Iron Works, Ltd., Lesage Ave., at $28,469.

St. Tite Village, Que.
Trepanier & Beaudry, Badeaux St., Three Rivers, general contractors for a school costing $43,000.

Toronto, Ont.
Contracts on the repair shops and storehouse being erected for the Toronto Transportation Commission by John V. Gray Construction Co. Ltd. have been awarded as follows: Electrical, J. E. Meyers, 4 Gould St., Toronto; sprinklers, heating and plumbing, W. J. McGuire Ltd., 91 Jarvis St.; roofing, sheet metal, mastic flooring and creosoted wood block flooring, A. W. Carmichael Ltd., 918 Palmerston Ave.; elevator, Otis Fensom Elevator Co. Ltd., 50 Bay St.; ornamental iron, Dennis Wire and Iron Works, 36 Lombard St.; glass and glazing, Pilkington Bros., 19 Mercer St.; Reinforcing bars, Burlington Steel Co., 60 King St. W.; column spirals, Trussed Concrete Steel Co. of Canada, 34 King St. W.; steel sash, Canada Metal Window Co., River St.; rolling steel doors, A. B. Ormsby Co. Ltd., 48 Abell St.; smoke breechings, Engineering & Machine Co. of Canada, St. Catharines; sprinkler tank, Horton Steel Co., Bridgeburg, Ont.

The Toronto Transportation Commission has awarded the general contract for its coal and ash handling plant to McNiven Bros., 70 Victoria St.

Weston, Ont.
Contract for excavating for the Industrial School has been awarded to Lioni & Co., 1450 Dufferin St., Toronto. S. B. Coon & Son, 4 St. Thomas St., Toronto, architects.

Business Buildings and Industrial Plants

Acton, Ont.
New tenders will be called about th end of the month on a $15,000 factory f Thompson Motor Supplies Ltd., 41 Queen St. W., Toronto.

Antigonish, N. S.
Bank of Nova Scotia contemplate an office and if a suitable site can be secured building may commence about May 1.

Berwick, Ont.
The Berwick Fruit Co., contemplate re-building warehouse recently destroyed by fire at a loss of $42,000.

Calgary, Alta.
Work will commece at once on repairs to a billiard room costing $10,000. Bennett & White are the general contractor W. M. MacLean, 8th Ave. E., owner.

Hamilton, Ont.
The general contract for a store and apartments for S. Bolus, 309 King St. E., has been awarded to Mackay Bros., St. Eloi Apts.

Lansing, Ont.
Plans for a branch for the Sterling Bank are being prepared by Langley & Howland, York Bldg., Toronto.

Listowel, Ont.
As soon as the weather permits the Perfect Knitting Mills will have an addition built to their plant at a cost of $125,000. M. K. Becker, president.

London, Ont.
An addition to their present building is contemplated by London Metal Products, Ltd., at a cost of $10,000. C. A Raftrey, manager.

Melbourne, Ont.
Plans are being prepared for Campbell Bros. for a garage and auto repair shop costing $10,000. Interested in prices of materials.

Montreal, Que.
In about a month J. O. Gravel, 50 Notre Dame St. W., will probably call teders on an office building. Plans are being prepared.

Belgo Canadian Realty Co. Ltd., 86 Notre Dame St. W., will alter a departmental store into stores and light manufacturing flats. D. J. Spence, Beaver Hall Hill, architect.

Phillias La Riviere, 1244 Delorimiere Ave., plans to erect a public garage.

Early in April J. A. Vaillancourt, 340 Metana St., will commence work on a stable costing $7,000.

Store and three flats being built by W. A. Gendron, 125 Archibald St., costing about $12,000. A. Gendron, general contractor, 211 Cardinal St.

Tenders will be called shortly on a grain elevator costing $2,500,000 for the Harbor Commission, 50 Common St. J. S. Metcalfe, 54 St. Francois Xavier St., engineer.

Ottawa, Ont.
Tenders will be called shortly for the erection of a $150,000 bakery for Standard Bread Co. Sydney Comber, 127 Stanley st., Montreal, architect.

This spring the Ottawa Service Station will erect a new building. Mr. Drouin, manager, 79 Metcalfe Ave.

K. Kohen, 310 Somerset St., is rebuilding a store and apartments at a cost of $15,000.

Owen Sound, Ont.
Owen Sound Creamery Co. will build a creamery costing $4,000. Foster & Clark, architects.

Regina, Sask.
Plans are being prepared for a store building for Edwin Jackson, 2345 Rae St., by Storey & Van Egmond, Regina.

Riviere-du-Loup, Que.
Molson's Bank will shortly build a $6,000 branch. P. L. Turner, Montreal, architect and J. A. Charest, general contractor.

St. John, N. B.
Work will commence at once on a $35,000 factory for the Purity Ice Cream Co., Stanley St. H. C. Mott, 15 Germain St., architect. J. A. Grant & Co., Market Sq., general contractors.

Sault Ste. Marie, Ont.
Bryans Ltd., 642 Queen St., will make alterations and extensions to their store at a cost of $8,000. Work will commence about May 1.

Stratford, Ont.
New tenders will be called about Mar. 10 on a factory for Stratford Frames and Novelties Ltd. N. M. Upshall, 265 Adelaide St. W., Toronto, president.

Three Rivers, Que.
Three Rivers Harbor Commission contemplate an elevator at a cost of $150,000. A. D. Swan, Birks Building, Montreal, consulting engineer. J. Ryan, Three Rivers, secretary.

Toronto, Ont.
Kaplan & Sprachman, 289 Dundas St., have called for tenders on 4 stores and apartments.

B. Swartz, 336 Dundas St. W., is receiving tenders for a $10,000 warehouse for Levi's, 74 Don Esplanade.

Store and apartment costing $8,000 will be built by Henry Massie, 682 Pape Ave.

Tenders for heating, painting and plastering six stores and apartments costing $40,000 wanted by Grimshaw Bros., 1176 Danforth Ave., Toronto.

Textile building costing $1,000,000 contemplated. Yolles & Rottenberg Ltd., 366 Adelaide St. W., will probably be the architects.

Wm. Steele & Son, Ryrie Bldg., are preparing plans for a dye house and manufacturing building for the Toronto Carpet Company, 1197 King St. W.

Plans are being revised and tenders will be called shortly for an addition to the Ault & Wiborg Co's. plant on Charlotte St. Sproat & Rolph, 36 North St., architects.

Plans are being prepared for the Empire Clothing Mfg. Co., 160 John St., for a seven storey building. B. Brown, 487 Spadina Ave., architect.

CONTRACTS AWARDED

A. Leduc, 351 St. Christophe Colombe St., has the general contract for an addition to a bakery for I. Caron, 2386 St. Hubert St. Cost of new building will be about $17,000.

Montreal, Que.

Toronto, Ont.
Dickie Construction Co., which is making alterations to two branches of the Royal Bank has let the electrical contract for the Bloor St. branch to W. Brampton, 182a Jones Ave. The electrical contract for the Queen St., branch let to Nelson & Hawkins, 99 Adelaide St. W., and the plumbing and heating contract to Fiddes & Hogarth, 122 King St. E.

Three Rivers, Que.
Contracts awarded for the extension to the Wabasso Cotton Co's. mill are: Roofing, McFarlane Douglas Co. Ltd., 34 Dorchester st. W., Montreal; plumbing, L. E. Moulton & Co. Ltd., 142 Inspector st.; plastering, R. D. Clarke & Sons, 26 Lincoln ave.

Residences

Grimsby, Ont.
Residence costing $7,000 contemplated by Jas. Merritt, owner and general contractor.

Hamilton, Ont.
M. H. Coleman, 200 Park Row, is excavating for two residences costing $9,000.

Duplex residence costing $6,000 contemplated by M. Lewis, c/o Stowe Bros., general contractors, 250 Bold St.

W. R. Bennett, 55 Leinster Ave., is excavating for three residences costing $14,000.

Limoilou, Que.
Work has commenced on a duplex residence for R. Blanchette, costing $6,000. J. Garvel, 105-5th St., builder.

London, Ont.
A residence costing $7,000 contemplated by H. M. Peterman, Loan Bldg.

Montreal, Que.
Private tenders will be called in about a week for 36 suites of aprtments for G. B. Lafond, 565 University Ave. Bigonesse & Bigonesse, 182 St. Catherine St., architects.

Tenders for apartment houses costing $500,000 will be called shortly by Bigonesse & Bigonesse, architects, 182 St. Catherine St.

Four flats costing $12,000 will be built for J. O. Bellair, 115 Archibald St., by A. Gendron, 211 Cardinal St.

Two cottages costing $10,000 contemplated by the Dennis Construction Co., 3820 St. Lawrence Blvd.

R. Sanscartier, 3203 Casgrain St., has the foundations in for a $6,000 residence.

Residence costing $9,000 being built by J. H. Vermette, 3142 St. Christophe Colombe St.

Ottawa, Ont.
Tenders on a residence for J. R. Booth Jr. will be received by Burritt & Kingston, Hope Chambers, architects, until Mar. 9.

$6,000 duplex residence contemplated by J. H. Sanderson, 118 Rochester St.

Residence costing $12,000 contemplated by W. J. Kennedy, McLeod St. Noffke, Morin & Sylvester, Central Chambers, architects.

A $10,000 duplex residence proposed by E. Faith, Bank St. Tenders will be received by Noffke, Morin & Sylvester, Central Chambers.

Outremont, Que.
Thos. Gray, 976 Tupper St., expects to proceed with work on three flats costing $12,000, in April.

Point Grey, B. C.
Work will proceed at once on a $15,000 residence for Norman R. Lang, 3338 Granville St., Vancouver. A. A. Coa, 909 Birks Bldg., Vancouver, architect and T. Glover, 2201-37th Ave. W., Vancouver, general contractor.

Quebec, Que.
Work is in progress on a residence and barn for Amedee Demers, 5 McMahon St. Buildings estimated to cost about $40,000.

Regina, Sask.
A. B. McGill, 2059 Smith st., is having plans prepared for a residence costing $12,000. Storey & Van Egmond, Regina, architects.

Sarnia, Ont.
Chester H. Belton, London Rd., contemplates a residence costing $15,000. C. H. Woods, 217½ Christina St., architect.

Residence costing $13,000 contemplated by Dr. H. Mustard, Talfourd St. C. H. Woods, architect. All sub-trades to be let.

Stratford, Ont.
Gordon Rankin, 81 Ontario St., contemplates a dwelling costing $10,000.

Toronto, Ont.
A. A. Hobson, 70 Hilton Ave., is excavating for a $20,000 residence for W. W. Canham, 27 Wells Hill Ave.

Fred Stevens, Moscow Ave., is excavating for two pair of residences costing $7,000 per pair.

Twelve to eighteen bungalows proposed by Churchill & Morrell, 699 Woodbine ave., on which work is expected to commence shortly.

Three residences costing $10,000 contemplated by Arthur Hindle, 98 Strathcona Ave.

Two bungalows, costing $6,500 each, will be built by J. Meldrum, 64 Evans St. Small trades to be let.

Geo. Richards, 109 Parkmount Rd., is building a pair of residences costing $7,000.

Thirty residences costing $7,000 per pair, will be built by Grimshw Bros., 1176 Danforth Ave., who want tenders on brickwork.

Contract for $15,000 residence for Mrs. Boyd, 411 Danforth Ave., will be awarded shortly. J. Hunt Stanford & Son, 67 Yonge St. Arcade, architects.

Fred. Michand, 340 Kingswood Rd., wants tenders on residences contemplated at a cost of $40,000.

H. Duff, 2763 Danforth Ave., is building five detached residences.

Vancouver, B. C.
Sketch plans are prepared for a six suite apartment house costing $25,000 for Mrs. Robert Kelly, 1690 Angus ave. Townley & Matheson, 325 Homer st., architects.

Vernon, B. C.
D. N. Ferguson, Armstrong, B. C., has

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

Tenders Wanted

Tenders will be received by the Undersigned until **Monday, March 19th, 1923**, for the various work required in the erection of a

School Building

North Huron Street, York Township.

Gordon & Helliwell, Architects,
526 Confederation Life Building 10

Tenders for Sludge Pump and Motor

Tenders will be received by registered post only, addressed to the Chairman, Board of Control, City Hall, Toronto, up to noon on

Tuesday, April 10th, 1923

for the supply and installation of one three-million Imperial gallon centrifugal sludge pump and motor.

Envelopes containing tenders must be plainly marked on the outside as to contents. Specifications and forms of tender may be obtained at the Works Department, Room 6, City Hall. Tenderers must comply strictly with conditions of City By-law as to deposits and sureties, as set out in specifications and forms of tender.

The lowest or any tender not necessarily accepted.

C. ALFRED MAGUIRE, (Mayor),
10 Chairman, Board of Control.

CITY OF BRANTFORD

Tenders for Reinforced Concrete Arch Bridge

Sealed Tenders marked "Tender for Lorne Bridge" addressed to Ald. C. S. Moyer, Chairman Board of Works, in care of the City Clerk, Brantford, Ontario, will be received until 12 o'clock noon

Saturday, March 24th, 1923

for the construction of a three span reinforced concrete arch bridge, approximately five hundred feet long and sixty four feet wide, across the Grand River.

Plans and specifications may be seen and Form of Tender obtained at the City Engineer's office, Brantford on and after Monday March 5th, 1923

The lowest or any tender not necessarily accepted.

Frank P. Adams,
City Engineer.

City Engineer's Office,
Brantford, February 27th, 1923 10-12

RATES

20 cents per agate line (14 lines to the inch) Positions Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

Tenders Wanted

Tenders addressed to the Architect endorsed "Tender for East Ward School, Pembroke" will be received until 12 o'clock noon

March 31st, 1923,

for the erection of Public School.

Plans and Specifications may be seen on or after March 10th at the office of W. C. Keighley, Architect, Grand Trunk Offices, Pembroke, Ontario; or Plans and Specifications may be obtained by depositing with the Architect a certified cheque for $50.00 which will be refunded upon return of the plans and specifications and the receipt of a bona-fide tender.

All tenders must be accompanied by a certified cheque for five per cent of the amount of the tender.

A Guarantee Company's Bond for ten per cent of the amount of tender will be required when contract is signed. Five per cent deposit will be returned upon execution of Bond.

The lowest or any tender will not necessarily be accepted.

R. L. McCORMACK,
Chairman Board of Education,
10-11 Town of Pembroke, Ont

Sealed Tenders for Concrete Roadway for the County of Waterloo

For approximately 3,600 sq. yds. 7" concrete 18′ wide West of the Village of Wellesley, Provl. County Road No. 109.

For approximately 2,000 sq. yds. 8" concrete pavement 20′ wide South of the Village of Wellesley, Provl. County Road No. 109.

For approximately 18,773 sq. yds. 7" concrete pavement 16′ wide between Heidelberg and St. Clements, Villages, Provl. County Road No. 109.

For a 14 foot span reinforced concrete slab bridge near German Mills, County Road No. 12.

Specifications and form of tender can be seen at the County Clerk's Office, Court House, Kitchener, Ont.

For all information apply to L. S. Lichty, County Road Superintendent, Wellesley, Ont.

All tenders to be by the square yard. Tenders will be received up until 12 o'clock noon.

Thursday, March 15th, 1923

The lowest or any tender not necessarily accepted.

All tenders to be addressed to Samuel Cassel, County Clerk, Court House, Kitchener, Ont., and marked cheque of five per cent of contract price to accompany each tender.

9-10

REQUIRED—Brown Hoist, also Dredge and dump and flat scows. Madden & Son, 116 St. Peter Street, Quebec 10

Tenders Wanted

Sealed tenders, marked Tender, and addressed to the undersigned, or to John A. Huey, County Clerk, Sarnia, will be received up till 12 o'clock noon of **Wednesday, March 14th, 1923**, for the furnishing of all material, erection and completion of a 150′ centre to centre bearings,

18 ft. Roadway Bridge

known as Brickers Bridge over Bear Creek on 6-7 S,R, Con. 5, Moore Township, Lambton County.

Tenders may be for the abutments and floor, for the Steel work, or for the entire work of the Bridge.

Plans and specifications may be examined at the office of George A. McCubbin, County Engineer, Chatham; or John A. Huey, County Clerk, Sarnia; or John McCallum, County Road Supt., Alvinston, Ontario.

All tenders must be accompanied by a marked cheque for 5% of the amount of tender and the name of an approved Guarantee Company.

Lowest or any tender not necessarily accepted.

Dated at Alvinston, this 12th day of February, 1923.

JOHN McCALLUM,
8-10 County Road Superintendent.

DEPARTMENT OF ROADS

TENDERS

Levis - Rimouski Highway, Town of Lauson

Quebec - St. - Simeson Highway, Village of Giffard

Tenders made on forms supplied by the Department of Roads and placed under envelopes bearing the words: "Tender," according to the case, Levis-Rimouski Highway or Quebec-St.-Simeon Highway," shall be received at the office of the Minister of Roads, in the city of Quebec, Government Building, up to one o'clock of the afternoon, on

Tuesday, the twenty-seventh (27) of March, 1923,

for the construction of Quebec-St.-Simeon Highway in the municipality of the village of Giffard, in the county of Quebec, Oil Waterbound Macadam, 5056 feet; and for the construction of Levis-Rimouski Highway in the municipality of the Town of Lauson, in the county of Levis, Concrete Pavement, 9040 feet, and Oil Waterbound Macadam, 20,750 feet.

J. L. BOULANGER,
Deputy Minister

Quebec, March 3rd, 1923. 10

Business Opportunity

Contracting firm want man with experience in all branches of road construction, especially grading work. One able to make investment preferred. Good salary and splendid opportunity offered to the one capable of assuming responsibility. State full particulars in first letter. Box 164, Contract Record, Toronto. 10

STEEL PILING

1000 tons 40′ long.
14″ x ⅜″ Arch Web.
7″ x ¼″ Straight Web.
All ready to load.
UNIVERSAL EQUIPMENT COMPANY,
1 T.f. Niagara Falls, Ont.

WANTED

Rent or buy—one small Dredge, on a small job. Suitable for dredging a small creek half yard dipper or smaller required. Reply to Bryson & Irwin, Wiarton, Ontario, Contractors 8-11

FOR SALE

Byers No. 3 Auto Crane, road wheels; 38 ft. boom; ½ yard Clam—capacity 350 yards per day, located Windsor. Specifications and terms apply Cadwell Sand & Gravel Co. Ltd., Windsor, Ont. 7-10

Some One Wants to Buy

The equipment or machinery that you are not using.

It may be occupying valuable space in your yard or shop, collecting dust, rust and hard knocks.

Sell it before "Depreciation" scraps it.

Use the Tender & For Sale Department. It helps others, let it help you.

FOR SALE

STEEL PLATES—STRUCTURAL GRADE

1—58″ x ⅜″ x 8′ 0″ long
1—60″ x ⅜″ x 6′ 6″ "
1—60″ x ⅜″ x 9′ 7″ "
1—60″ x ⅜″ x 27′ 0″ "
1—72″ x ⅜″ x 8′ 0″ "
1—72″ x ⅜″ x 17′ 0″ "
1—48″ x ⅝″ x 20′ 0″ "
1—60″ x ⅝″ x 7′ 9″ "
1—60″ x ⅝″ x 32′ 6″ "
3—60″ x ⅝″ x 40′ 0″ "

The above List of Plates weighs about 15 tons.

This is New Stock, although rust colored from lying in our Stockyard.

In addition we have some Narrow Plates, and a quantity of Angles, Tees, Zees and Bars. Send for a complete List and Price if you are interested.

Mill deliveries are slow; here is an opportunity to secure steel quickly.

THE MARITIME BRIDGE CO. LTD.,
10 New Glasgow, N.S.

SHEFFIELD FIRM OF STEEL AND TOOL MANUFACTURERS are desirous of appointing an agent for Canada, and with this in view invite applications from firms of repute well known to Steel Consumers and Government Departments. Must understand the Steel Trade thoroughly and be capable of large volume of business. Write fully to "BRITISH" C/o Street's, 30, Cornhill, London, England. 10-11

FOR SALE

Keystone Excavating Machine, complete with two sticks, skimmer scoop, and three ditching scoops; this machine has been used only one season and is guaranteed to be in first class condition. Price $4,500 f.o.b. St. John, N. B.

Austin Backfiller with caterpillar traction, 4-cylinder Buffalo engine, in equally good condition. Price $2,500 f.o.b. St. John, N. B. Canada Lock Joint Pipe Limited, 65 Pleasant Boulevard, Toronto, Ont.; or St. John, N. B. 6-T.f.

Plant for Sale

The County of Lincoln offer the following road machinery for sale.

2 Road Rollers, 2 Gas Tractors, 1 Scarifier, 1 Climax Oil distributor, 4—3 yd. reversible dump trailers, 2—10 H.P. Vertical Boilers, 2—Oil Tanks with heating appliances, 1 Four Wheel Drive Truck, 1 Steam Tractor, 1—10″ x 20″ jaw crusher with equipment, 1 Derrick and Hoist complete.

Details of the above plant may be obtained and arrangements made for inspection on application to the undersigned.

F. N. RUTHERFORD,
County Engineer,
9-10 St. Catharines, Ont.

To Contractors and Others

There will be sold by Public Auction at the Town Hall, Cayuga, Ont., on the 3rd day of March, 1923, at two p.m. a valuable

Road-stone Quarry and Crushing Plant

on the Talbot Road, about four miles from Cayuga in the County of Haldimand.

For particulars and conditions of sale apply to Ludwig & Ballantyne, Continental Life Building, Toronto, Harrison Arrell, K.C., Caledonia, Ont., R. S. Colter, Barrister, etc., Cayuga. 8-10

FOR SALE

1 60 H.P. Waterous Locomotive Type Boiler.
1 40 H.P. Vertical Engine.
1 30 H.P. Vertical Engine.
1 25 H.P. Vertical Engine.
2 3″ - 2″ Steam Pumps.
1 60′ c to c belt elevator 26″ belt 24″ buckets.
1 24″ x 24″ Friction Hoist.
23 2 cu. yd. 4′ gauge Quarry Cars.
1 150 H.P. Erie City Steam Engine.
1 48″ Revolving Screen.
1 Traction Engine.
1 Feed Water Heater.
Several 6″ Steam Gate Valves.
2 Locomotive Air Pumps.

All above machinery can be seen at our plant, Hagersville, Ontario.

8-11 Hagersville Quarries, Limited.

CONSTRUCTION SUPERINTENDENT with 15 years experience handling all classes of building and water work, wants position. A1 testimonial and guarantee results. Will go anywhere Box 147, Contract Record, Toronto. 8-10

WANTED SUPERINTENDENT for Asphalt Paving work. Must be capable of taking full charge and be fully experienced in all branches of the work. None but experienced men need apply. Highest salary for capable man. State age and references. Apply, Dufferin Construction Co. Ltd., 210 Victoria St., Toronto, Ontario. 10-11

A Service to the Profession

Every man wishing to tender must first see the plans and specifications.

If the plans are in Montreal and he is in Vancouver the inspection is a problem. We, however, with your assistance, are able to solve it. Place them on file at any or all of the offices of the "Contract Record" throughout the Dominion.

Contractors, engineers and allied manufacturers read the "Contract Record." It is the logical publicity medium for the announcement of tenders wanted.

Send us your plans. They will receive the best of care.

A room is reserved in each of our offices for examination of your plans by possible bidders.

Contract Record
and Engineering Review

Toronto - - - 345 Adelaide St., W.
Montreal - - 119 Board of Trade Bldg.
Winnipeg - - - 302 Travellers' Bdg.
Vancouver - - - 106 Winch Bldg.

OPEN FOR POSITION as foreman or superintendent, 20 years experience concrete bridge and culvert, pile driving, coffer dam work. References if necessary. Will go anywhere. Box 495, Burlington, Ont. 10-12

POSITION WANTED—Civil Engineering graduate, (Structural) with experience covering drafting, instrument-man, inspection, cost and timekeeping, desires opening with engineering or contracting concern. Excellent references. Box 166, Contract Record, Toronto. 10-11

Waterworks for Cartagena

The basis for a contract with the Cartagena Water works for the improvement and extension of the present system to an ultimate capacity of 4,000,000 gallons per day has been approved by the Municipal Council of Cartagena, according to reports from Cartagena, Columbia. Details regarding the design are not yet available, but it is indicated that pumping equipment, piping, and the equipment necessary to complete the project will be required.

World's Oldest Subway

London's Metropolitan Railway has just celebrated its diamond jubilee. Sixty years ago its first train, drawn by a quaint, squat little steam engine, made the first trip in the history of underground railways over a track which measured only three and three-quarter miles. Today its long string of cars, drawn by sixty-five mile-an-hour electric tractors, speed along every few minutes over lines which are continually stretching out like tentacles into new areas.

It was in 1863 that those little trains, with coaches divided into small compartments, began to run. For twenty years before that all sorts of fantastic schemes had been mooted for establishing a London underground railway. One idea was to drain the Regent's Canal and transform it into a railway; another was to construct a Crystal Way, to be covered with glass and to be combined with a boulevard all around London. The original line was from Bishop's Road, Paddington, to Farringdon Street—almost a toy railway.

a $3,500 residence under construction for A. E. Parlow. Bell & Curtis, architects, Vernon.

Victoria, B. C.
H. Leggett & Gerardeau, general contractors, 1916 Davie St., are excavating for a $20,000 residence for Chas. Strangeman, c/o general contractor.

Windsor, Ont.

D. A. Banwell, 29 McEwan Ave., will commence work shortly on a residence costing $12,000.

CONTRACTS AWARDED

Montreal, Que.
On residence costing $12,000 being built by Thos. Gray, 976 Tupper St., contracts have been awarded as follows: Langston & Co., 968 St. Catherine St. W., electrical; Union Architectural Iron Works, 326a Clarke St., ornamental iron.

Contracts for alteration of residence into apartments awarded as follows: Electrical, Mr. Bramhall, c/o general contractor; plumbing and heating, A. Cooper, 86 Victoria Sq.; plastering, Bordeaux & Dupre, c/o general contractor.

Montreal West, Que.
Wm. Rutherford & Sons, 38 Percival Ave., have the millwork contract for four residences costing $35,000.

Outremont, Que.
J. S. Long has the tiling contract for three residences being built by F. Gray, general contractor, Tupper St.

We Issue Surety Bonds

for Contractors, for Public Highways, Contracts and all Municipal and private Corporation work.

We keep up to date information on contracts let and tenders called.

Try our service.
Phone Main 3476

Special Toronto Representatives

Fidelity Insurance Co. of Canada

[illegible]

Saskatoon, Sask.
The general contract for a residence costing $13,500 has been awarded to Miners & Ball ,9th St. A. Bowman, 214 9th St., owner. R. M. Thompson, Bank of Nova Ssotia Bldg., architect.

Toronto, Ont.
Travis & Hunter, 125 Rhodes Ave., have the masonry contract for two pair of residences costing $20,000; Day & Hill, 480 Strathmore Blvd., builders.

Verdun, Que.
On flats costing $60,000 contracts have been awarded as follows: G. E. Hardy, 1470 Papineau Ave., roofing; Gustine Chenier & Co., 10 Park Ave., electrical. F. L. Beique, 540 Sherbfooke St. W., owner.

Power Plants Electricity and Telephones

Drummondville, Que.
Southern Canada Power Co., 20 St. Nicholas St., Montreal, contemplates a transmission line from Drummondville to Richmond. L. C. Haskel, purchasing agent.

St. Etienne des Gres, Que.
St. Maurice Paper Co. has applied to the Provincial Government for permission to erect a power plant and develop water power.

St. John, N. B.
H. O. Clark, Ferry Bldg., general contractor, is in the market for cement and re-inforcing for the $100,000 sub-station for the Civic Hydro Commission.

CONTRACTS AWARDED

Lake Kenogami, Que.
Nova Scotia Construction Co., 213 Drummond Bldg., Montreal has been awarded the general contract for storage dams by the Quebec Streams Commission at $986,000. O. Lefevbre, is Chief engineer.

Miscellaneous

Brampton, Ont.
Four large greenhouses are contemplated by the Dale Estate, Main St.

Brantford, Ont.
City Council contemplate a mausoleum in Mount Hope cemetery. Alderman J. J. Fisher, Chairman of buildings and grounds committee.

Monteral, Que.
J. J. Joubert Ltee., 975 St. Andre St., have let the contract for a radial brick chimney, 6 ft. by 150 ft., to Wm. Summerhayes & Sons, Rochester, N. Y. Consulting engineer, J. A. Burnett, M.E. [illegible]

Province of Quebec.
Recent incorporations published in the Quebec Gazette include; Badgley Construction Co. Inc., which will carry on business as a construction company and dealers in building material, with head office at Montreal. Standard Supply Co., Ltd., will manufacture and deal in tar, tarred paper, roofing, and paving materials, etc. Ernest de Bellefeuille and F. L. Coulombe, interested. Head office is in Montreal. McRitchie & Black are incorporated as builders and contractors. Head office will also be located in Montreal. L'Enterprise Generale Limitee de Riviere-du-Loup will deal generally in all building material and carry on business as builders and contractors. The head office of the company will be located in Riviere-du-Loup.

Toronto, Ont.
Gladman Construction Company, Limited, recently formed, will carry on business as contractors and builders and manufacturers of any material which can be used directly or indirectly by contractors and builders.

All Kalamein Windows for the new building in the course of erection for the T. Eaton Co., Yonge st., furnished by the Fireproof Door Co. Ltd., Toronto.

Victoria, B. C.
Until Mar. 5 E. S. Mitchell, purchasing agent will receive tenders for the City oi Victoria for the supply of 2,400 lineal ft. of 12 inch cast iron pipe, 240 lineal feet of 8 inch cast iron pipe and special cast iron fittings.

CONTRACTS AWARDED

Cttawa, Ont.
The contract for refined tar for th City of Ottawa has been awarded t Dominion Tar & Chemical Co. Ltd., 171 St. James St., Montreal.

Toronto, Ont.
The contract for excavating and foundations for a $95,000 recreation club on Dufferin St., has been awarded to E. Ward, 1657 Dufferin St. Ellis, Obor & Ellis, architects. Dineen Bldg.

Fires

Beauceville, Que.
Building owned by P. T. Lagare, 27

WE WILL BOND YOU

Credit for you

Using our Guaranty Bonds on your tenders means a direct addition to your credit at comparatively insignificant cost.

Resources over $31.790.000
Canadian Securities $ 2.247.500

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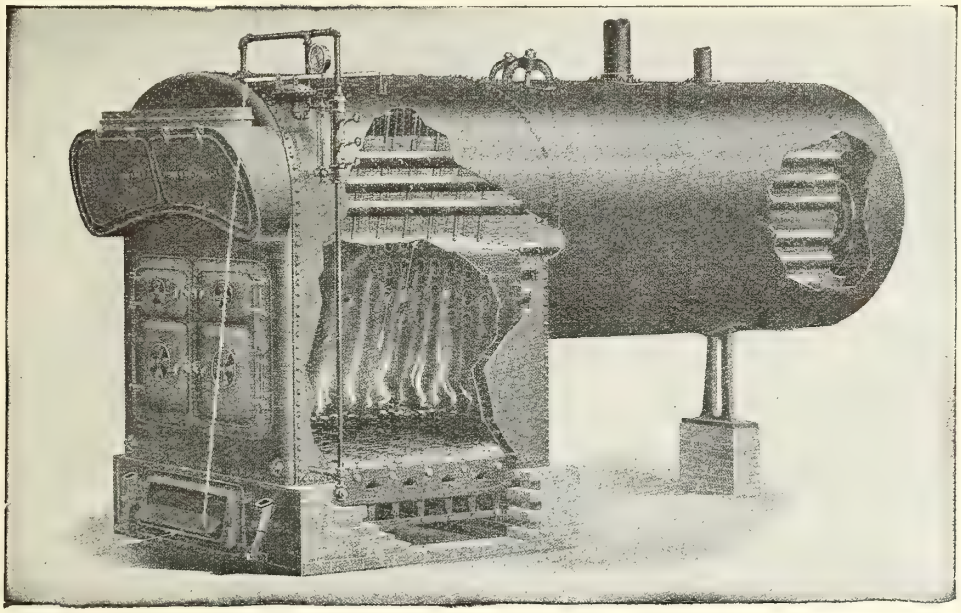
THE JOHN INGLIS CO.

LIMITED

ENGINEERS AND BOILERMAKERS

ESTABLISHED 1860



BOILERS Of all types built to suit requirements.

TANKS, Stacks, Water Towers, and all classes of Steel Platework.

Engines and Pumps Marine, Corliss and Pumping Engines; Centrifugal Pumps, and all classes of Special Machinery.

First class workmanship—Best quality of materials—Prompt delivery

Write us for Prices, Catalogues, etc.

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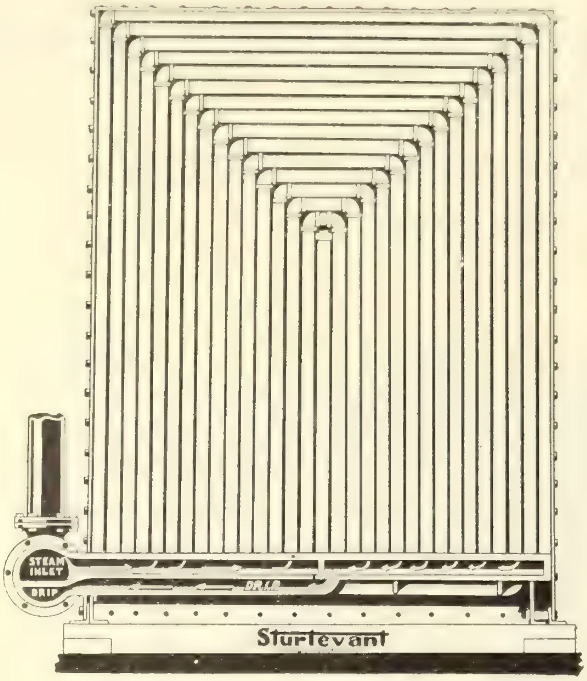


Making Every Unit of Heat do its Share

Sturtevant heating and ventilating systems keep hot air in motion. That's the secret of making the best possible use of every heat unit.

No warmth clings to the steam pipes in a Sturtevant installation or rises wasted to the roof.

Folder 606 applies particularly to your field. Ask for it and write Sturtevant Engineers to help you cut your heating bills.

B. F. Sturtevant Company
of Canada, Limited
Montreal - Galt - Toronto

Sturtevant
PUTS AIR TO WORK

St. Paul St., Quebec, damaged by fire to the extent of $15,000.

Montreal, Que.
Fire damaged a building owned by Yorkshire Insurance Co. to the extent of $25,000.

Late News

Barton Twp., Ont.
J. A. Armes, Charles St., Hamilton, has prepared plans and will call tenders shortly on a residence costing $10,000 for G. Bethune, Mountain Top.

Calgary, Alta.
Carter, Halls & Aldinger Co., Edmonton, have the general contract for a $40,000 warehouse for Great West Saddlery Co. Ltd., Calgary. General contractor will purchase material and let sub-trades.

Hamilton, Ont.
W. H. Cooper, Clyde Block, has the general contract for a printing plant costing $30,000 and will call tenders on all sub-trades. W. E. Stone, 78 Catharine St. W., owner.

Lakeview, Ont.
An addition to the clubhouse is contemplated by the Lakeview Golf and Country Club Ltd., Port Credit. Hall & Duerr, Lumsden Building, Toronto, have prepared plans for an addition costing $10,000. Architects will receive bulk and separate tenders.

Montreal, Que.
S. Kostrysky, 51a Hogan St., is excavating for store and apartments costing $12,000 and wants prices on materials.

Owen Sound, Ont.
Contracts on the $200,000 public school awarded as follows: Steel, Standard Steel Construction Co., 55 Main St. E., Welland. Roofing, T. I. Thomson, Ltd., 936-2nd Ave. E., Owen Sound; electrical, W. J. McLinden, Owen Sound; stone, J. S. Cook & Son, Wiarton, Ont.

Pontieux, Sask.
Plans are being prepared for the Roman Catholic Congregation for a $75,000 church. J. E. Fortin, Montreal, architect.

Regina, Sask.
Work will start at once on a warehouse and office building for Waterman-Waterbury Mfg. Co. Ltd., Regina. F. E. Watchler, general manager.

St. John, Que.
Bulk and separate tenders on a residence costing $20,000 will be received until April 1 by G. A. Savoy, St. John.

Seton, B. C.
Bridge River Power Co., 285 Beaver Hall Hill, Montreal, are having plans prepared for power development to the extent of $12,000,000. Transmission line to be carried into Vancouver is contemplated.

Toronto, Ont.
Ten residences proposed by Geo. Slightham, 51 Coleman Ave. Contracts for roofing, plumbing, plastering, heating, and painting not yet let.

Ed. W. Hachborn, 16 Humewood Court, has plans drawn for two $22,000 residences and expects to build this year.

BULLETIN №·8

·BURLINGTON·STEEL·Co·LTD·

RAIL CARBON

REAL STRENGTH

·HAMILTON·ONT·

·4½·BILLION·VIBRATIONS

AND STILL THE BUILDING STANDS UP

IN SALT LAKE CITY, THE UTAH COPPER Co HAVE A BUILDING WHICH, ACCORDING TO THEIR ENGINEER, HAS BEEN VIBRATING A MILLION TIMES A DAY SINCE 1907.

IT CONTAINS OVER 600 SEPARATING MACHINES WHICH VIBRATE SO INTENSELY THAT AN ORDINARY INDIVIDUAL CANNOT STAY IN THE BUILDING

THERE ARE 1500 TONS OF RAIL-CARBON BARS USED IN THE STRUCTURE AND STILL EVERYONE IS SATISFIED.

YET SOME ENGINEERS WILL TELL US THAT A HIGH-CARBON STEEL BAR IS NO GOOD WHEN SUBJECT TO VIBRATION

THE UTAH COPPER Co., SALT·LAKE·CITY

A CERTAIN RAILWAY EQUIPMENT COMPANY HAS IN THE LAST 15 YEARS, MANUFACTURED AND PUT INTO SERVICE ON RAILROAD ROLLING STOCK. 3,210,000 PIECES OF RAIL-CARBON STEEL, ROLLED IN THE FORM OF U'S OR CHANNELS TO FORM BRAKE-BEAMS.

IN 15 YEARS THEY HAVE NEVER HAD A FAILURE

SURELY SUCH A RECORD IS WORTHY OF CONSIDERATION

IF A NAKED BRAKE-BEAM WILL STAND UP YEAR IN YEAR OUT UNDER HEAVY-DUTY SERVICE, CERTAINLY A BAR OF THE SAME MATERIAL WHEN EMBEDDED IN CONCRETE IS FOOLISHLY SAFE

IF THE MOTHER RAIL STANDS UP UNDER THE POUNDING AND VIBRATION OF THE LOCOMOTIVE, WHY SHOULD THE LITTLE BABY RAIL STEEL RODS IN THE CONCRETE GIRDER BELOW FALL DOWN?

THINK IT OVER

THEN SPECIFY RAIL-CARBON STEEL BARS ACCORDING TO A.S.T.M. SPECIFICATION A-16-14, AND YOU WILL GET THE STRONGEST, PUREST AND BEST STEEL

BULLETIN № 9 – THE·MOTHER·RAIL.

Make a Better Job
By using
EMPIRE BRAND
Hardwood Flooring
MAPLE, BIRCH and PLAIN or
QUARTER CUT OAK
J. R. Eaton & Sons Limited
ORILLIA ONTARIO

BUILDERS'
HARDWARE
Get our quotations. Our goods are fully guaranteed.
Hardware Co. of Toronto
LIMITED. Phone Main 94
46 ADELAIDE ST. WEST, TORONTO

Color and Turbidity of Water
Determined with Accuracy

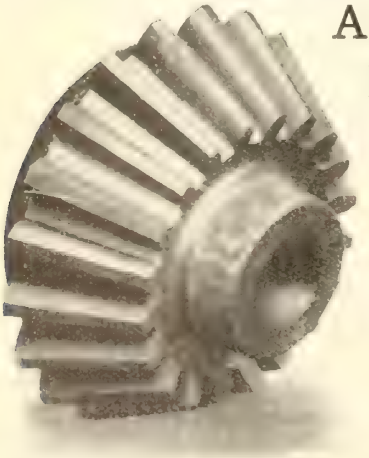
Water is often "colored" by vegetable matter or "turbid" from mud and silt carried in suspension. When water is used for a municipal supply, color and turbidity are always objectionable; when furnished to industries either quality is usually harmful to the products.

The U.S. Geological Survey Design Color and Turbidity Determining Instruments based on the Platinum-Cobalt methods of color measurement devised by Allen Hazen, C.E., make possible at small cost the scientific determination of color and turbidity of water.

We are prepared to furnish complete sets of these Instruments packed in neat, pocket-size cases ready for immediate use in the field.

Send for Bulletin No. 41

Builders Iron Foundry, Providence, R. I.
Canadian Representatives:
GENERAL SUPPLY CO., OF CANADA, LTD., Ottawa, Montreal, Winnipeg, Vancouver
ALLEN GENERAL SUPPLIES LTD., Toronto, Ont.



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Gears
CUT GEARS

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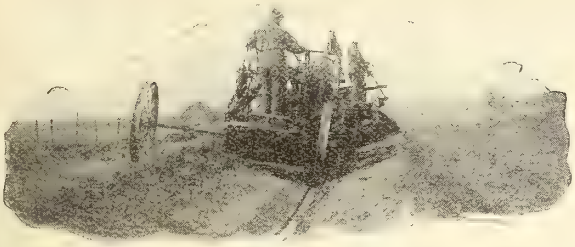
Tenders
A few dollars spent in advertising your proposals in the
Contract Record
and Engineering Review
would result in additional competition which might save your city or town or your client many hundreds of dollars



New Roads From Old

The Wise Engineer makes the utmost out of the old material in the road he is repairing, and uses

The Austin Road Scarifier

to loosen the good stone before adding a bond of new surface material.

This powerful Scarifier tears up the high or the uneven road surface to a depth of from two to four inches, and loosens effectively the low parts, or "potholes," as well. This reduces the irregularities to an even bed on which to roll and form the new crust—the new stone bonding with the old perfectly, in a most economical manner.

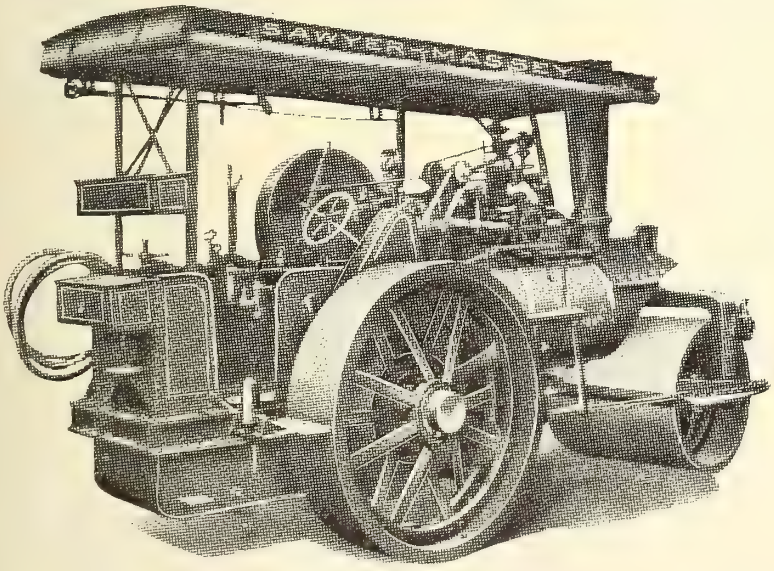
Our nearest branch will gladly mail you valuable and interesting Austin road-building facts and costs of equipment.

The Canadian Fairbanks-Morse Co. Limited

St. John Quebec Montreal Ottawa Toronto Windsor
Winnipeg Regina Calgary Vancouver Victoria

28

IF EXPERIENCE IS AN ASSET you are ASSURED of the benefit of it in any ROAD MAKING MACHINERY you purchase from the SAWYER-MASSEY COMPANY



Double Cylinder Steam Road Roller

Our line is complete—
Portable Rock Crushers.
Elevators, Screens and Portable Bins, 3 sizes.
Gravel Screening Plants.
Road Graders, 4 sizes.
Scarifiers, heavy and light.
Road Drags and Road Planers.
Dump and Spreading Wagons.
Steel and Wood Water Tanks.
Vertical Boilers 6 to 25 H.P.
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Contractors' Plows.
Traction and Portable Steam Engines.
Kerosene Burning Tractors.

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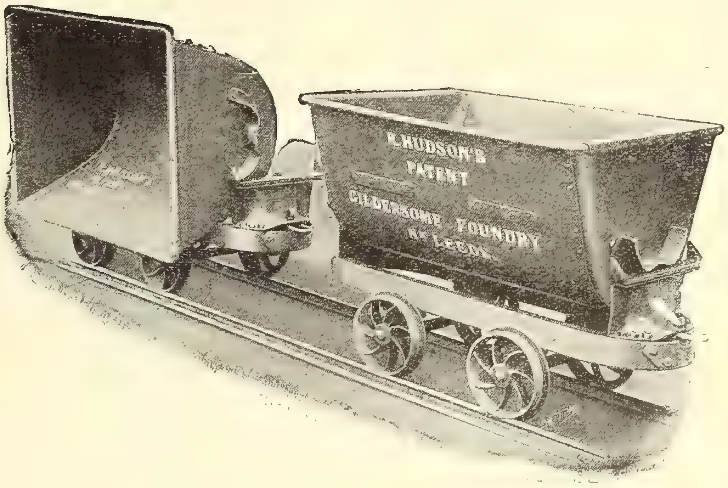
Branches and Warehouses— Winnipeg, Regina, Saskatoon, Calgary

Current Prices of Building and Engineering Materials

		Toronto	Montreal	Winnipeg	Vancouver
CEMENT (Delivered on job):—					
Retail lots including bags	per bbl.	$4.60	$4.16	$4.80	$3.70
Car lots, including bags	per bbl.	3.60	3.48	4.16	3.35
Refund on bags	each	.20	.20	.20	
LIME (Delivered on job):—					
Lump, in retail lots	per ton	14.30	14.00	.58 bu.	2.70 bbl
Lump, in car lots	per ton	12.70**	11.00	13.80 ton*	2.60 bbl
Hydrated, in retail lots	per ton	20.00	26.00	.60 bag*	30.00
Hydrated, in car lots	per ton	19.00	21.00	.54 bag*†	25.00
BRICK and TILE (Delivered on job):—					
Common face brick	per M.	24.00	16.50*	19.00	30.00
No. 1 dry pressed brick	per M.	31.00	30.00	36.00	70.00
No. 2 dry pressed brick	per M.	29.00	25.00	32.00	
Enamelled brick	per M.	125 up to	230.00	185.00	150.00
Wire cut brick, for foundation work	per M.	21.00	19.00		50.00
Sand lime brick	per M	17.00		18.00	
Hollow building tile	per M.			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	60-95	60-75	85-100	80.00
Fire clay	per ton	13-20	15-16.00	35.00**	22.00
STONE, SAND and GRAVEL (f.o.b. cars on siding):—					
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.00 yd.
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 "	" "
Crusher run	per ton	2.20½		3.00 "	" "
Rubble stone	per ton	2.45	1.70	15.00 cord	" "
Gravel, 2 in. screened	per ton	2.05		2.45 yd.	" "
Gravel 1 in. screened	per ton	2.31	1.50	2.75 "	" "
Sand, screened	per ton	1.42½	1.25	1.90 "	" "
Pit run	per ton	1.52¾	1.25	1.90 "	" "
STEEL and IRON (f.o.b. warehouse):—					
Mild steel bars, ¼ in. and heavier	per 100 lbs.	3.25 base	3.50 base	4.35	$4.00
Bands 3/16 in. and lighter	per 100 lbs.	3.75 "	3.50 "	4.85 base	
Hoops	per 100 lbs.	4.50 "	4.50 "		
Twisted and deformed bars	per 100 lbs.	3.35 "	3.50 "	4.20	4.00
Angles, channels and tees under 3 in.	per 100 lbs.	3.35 "	3.75 "	4.95	6.00
Structural shapes	per 100 lbs.	3.60 "	3.75 "	4.75	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.25 "	3.60 "	4.75	6.25
Plates—3/16 in.	per 100 lbs.	3.60 "	3.95 "	5.15	6.50
Plates—10 gauge	per 100 lbs.	4.15 "	4.25 "	5.45	6.50
Black sheets—28 gauge	per 100 lbs.	5.00 "	4.90 "	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.20 "	7.00 "	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	6.20 "	6.50 "	7.70	8.25-8.50
Rivets	per 100 lbs.	5.75 "	5.50 "	7.00 base	
Cast iron pipe	per ton	60.00	55.00		
VITRIFIED CLAY PRODUCTS (Delivered on job):—					
Sewer pipe, 4 in.	per ft.	.40	.30	.35	.38
Sewer pipe, 6 in	per ft.	.60	.45	.46	.48
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.55
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.70
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.85
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00	.90	.65	.75
Chimney tops	each	9.00	3.50–5.00	7.50	4.50–6.00
Discounts		45 % truck lots 50 % car lots	20 % 50 %	5 %	

CEMENT:—*Discount of 10 cts. per bbl. in 20 days. Price f.o.b. cars is $3.75 †Subject to 5% discount. **Excluding bags.
LIME:—*Discount of 5%. †Bag of 50 lbs. **Price f.o.b. cars is $11.70.
BRICK AND TILE—*f.o.b. plant.
STONE SAND AND GRAVEL:—*Winnipeg prices subject to 5% disco **Toronto prices include sales tax.

CONTRACTORS
Please Note



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TWO-WAY
STEEL DUMP CARS**

Roller Bearing, Steel Wheels. Especially suitable for Concrete, Rock, Cinders etc.

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Sole Canadian Distributors**

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CURRENT PRICES OF BUILDING AND ENGINEERING MATERIALS— continued

Lumber (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver*
Flooring, 1 x 3 and 4 in., clear, E. G. fir	per M.	90,00	60.00	84.00	55.00
Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	70.00	65.00	56.00	30.00
Flooring, No. 1 pine	per M.	70.00	80.00	64.80	
Flooring, No. 1 Spruce	per M.	48.00	40.00	39.60	
Flooring, birch and maple, 13/16 in. clear	per M.	130.00	110.00	152.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	130.00	125.00	140.00	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	70.00	60.00	56.00	30.00
V joint, No. 1 pine	per M.	70.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	43–58	45.00	63.75	
Red and Jack Pine, 2 x 4 to 12 in., com. rough	per M.	44/58	70.00	36.00	
Hemlock, 2 x 4 to 12 in.	per M.	40/44	40.00	36.00	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	40–50.00	50.00	36.00	11.00-13.50
Spruce, 1 and 2 x 4 to 12 in.	per M.	44/58	45-35	36.00	
Timbers, fir, 10 x 10 in. and up	per M.	63.00	58.00	47.00 base	17.-22.00
Lath, No. 1 white pine	per M.	16.00	12.00	12.00	
Lath, M. R. spruce	per M.	10.00	8.50	10.00	7.00
Shingles, XXX B.C. cedar	per M.	6.50	5.00	5.25	3.40
XX B.C. cedar	per M.	5.00	4.25	3.75	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	108.00	55.00
Fir casing	per M.	1 ct. per in.	100.00	108.00	
PAINTS, OILS, COLOURS (delivered):—					
White lead ground in oil, less than ton lots	per cwt.	14.55	13.75	14.85	15.80
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	22.00
Putty in bulk	per cwt.	5.45	4.25	5.50	9.25
Steel sash putty in bulk	per cwt.	5.95	6.00	8.75	7.75
Boiled linseed oil, in bbls.	per gal.	1.20	1.17	1.13	1.28
Raw linseed oil, in bbls.	per gal.	1.23	1.15	1.10	1.25
Turpentine, in bbls.	per gal.	2.20	2.10	2.15	1.60
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 4/5	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 1/5	.45
PLASTER (Delivered):—					
Hard wall plaster, sanded	per ton	13.50	15.00	25.00	30.00
Plaster of paris, in bbl. lots	per bbl.	6.00	5.35	1.60 bag*	7.50
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu.	1.50
LABOR:—					
Bricklayers	per hr.	1.00	.80–.90	1.15	1.06¼
Structural Iron Workers	per hr.	.85	.50–.75	1.25	1.00
Plasterers	per hr.	1.00	.80	1.05	1.06¼
Hoisting Engineers	per hr.	.70–.80	.50	.90–1.10	1.00
Plumbers	per hr.	.90	.60–.75	1.00	.90
Carpenters	per hr.	.80	.65	.90	.81¼
Painters	per hr.	.75	.55–.65	.80	.81¼
Electrical Workers	per hr.	.80	.65	.70– .90	1.00
Roofers	per hr.	.65	.65		.90
Laborers	per hr.	.40–.50	.30	47½–.55	.50–.56¼
Sheet Metal Workers	per hr.	.75			.90

LUMBER:—*Owing to the general unstable condition of the present lumber market, Vancouver dealers refuse to quote any prices at all especially for Prairie or Eastern publication. The prices are, moreover, fluctuating from day to day. Such prices as we quote are, therefore, averages and not standard.

PLASTER *Including bags.

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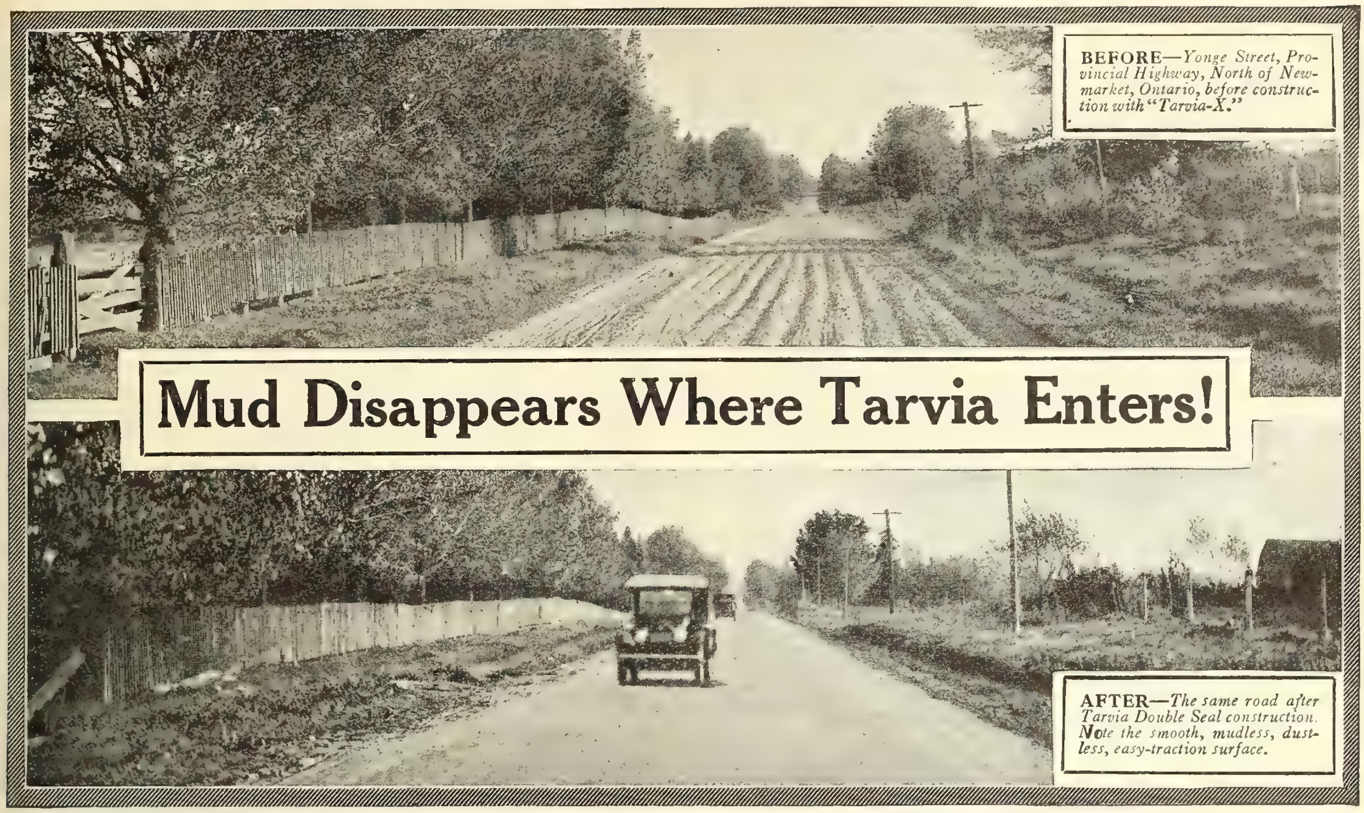

BEFORE—*Yonge Street, Provincial Highway, North of Newmarket, Ontario, before construction with "Tarvia-X."*

Mud Disappears Where Tarvia Enters!

AFTER—*The same road after Tarvia Double Seal construction. Note the smooth, mudless, dustless, easy-traction surface.*

THIS is an era of progress. And progress follows the line of least resistance. It can never reach the community that is marooned for weeks at a time in an ocean of hub-deep mud. Today the entire country is aware of these facts—is alive to the need of better roads.

From farm and town alike, comes the demand for durable, economical, all-year highways. The Age of Mud is giving way to the Age of Tarvia. For in the building of good roads Tarvia is playing a leading part. More and more road officials and rate payers are learning that Tarvia Roads give the utmost value for the least money.

Economy of first cost, and economy of maintenance bring smooth, dustless, mudless, all-year Tarvia roads within the financial reach of even the most humble community.

Tarvia is a coal-tar preparation for use in building new roads and repairing old ones. It reinforces the road surface and makes it not only mudless and dustless, but waterproof, frost-proof and automobile-proof. The granular surface of a properly constructed and properly maintained Tarvia road prevents skidding. Where existing macadam or gravel can be used as a base the cost of a traffic-proof Tarvia top is extremely low.

Illustrated booklet free on request.

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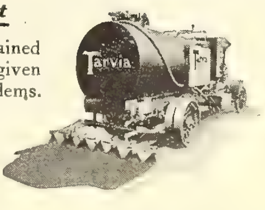
For Road Construction Repair and Maintenance

Special Service Department

This company has a corps of trained engineers and chemists who have given years of study to modern road problems. The advice of these men may be had for the asking by any one interested. If you will write our nearest office regarding your road problems, the matter will be given prompt attention.



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EASY TO START
ENGINES

LEADING CONTRACTORS PREFER the FULLER & JOHNSON Model "N" Gasoline Engines. Here are the reasons:

Simplicity of design. Extra long bearings. Long pistons with leak proof rings. Surplus horse power above rating. A governor which insures automatic regulation of the fuel. Perfect balance, reducing strain to a minimum and resulting in smooth, quiet running. Two sources of ignition — magneto and battery — giving double assurance of uninterrupted service. Simple, effective lubrication. Large cooling system that permits the engine to run long hours under heavy loads. Easy to start even in cold weather.

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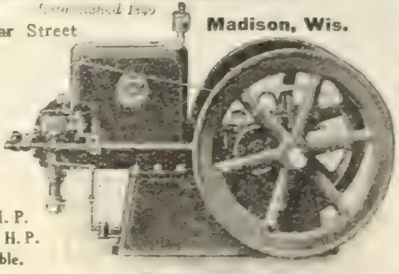

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1½, 3, 5, 7, 9, 12 H. P.
Other models up to 25 H. P.
Stationary or Portable.

This engine fills the contractors' requirements

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Reinforced Concrete Pipe
For Sewers and Culverts

Hard Steel Wire Reinforcement

Large stock of well matured pipe ready for immediate shipment.

Contractors save money on Winter haul.

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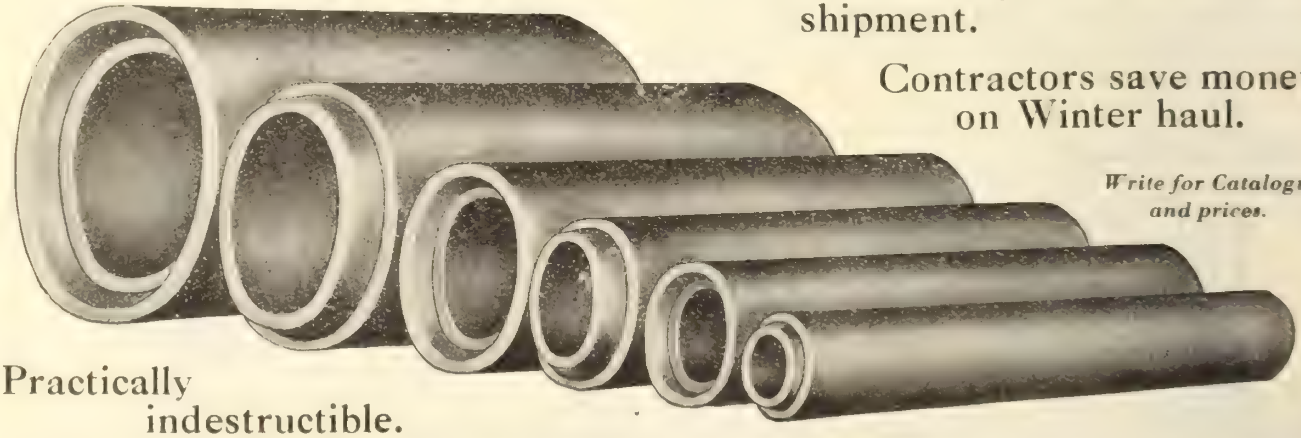

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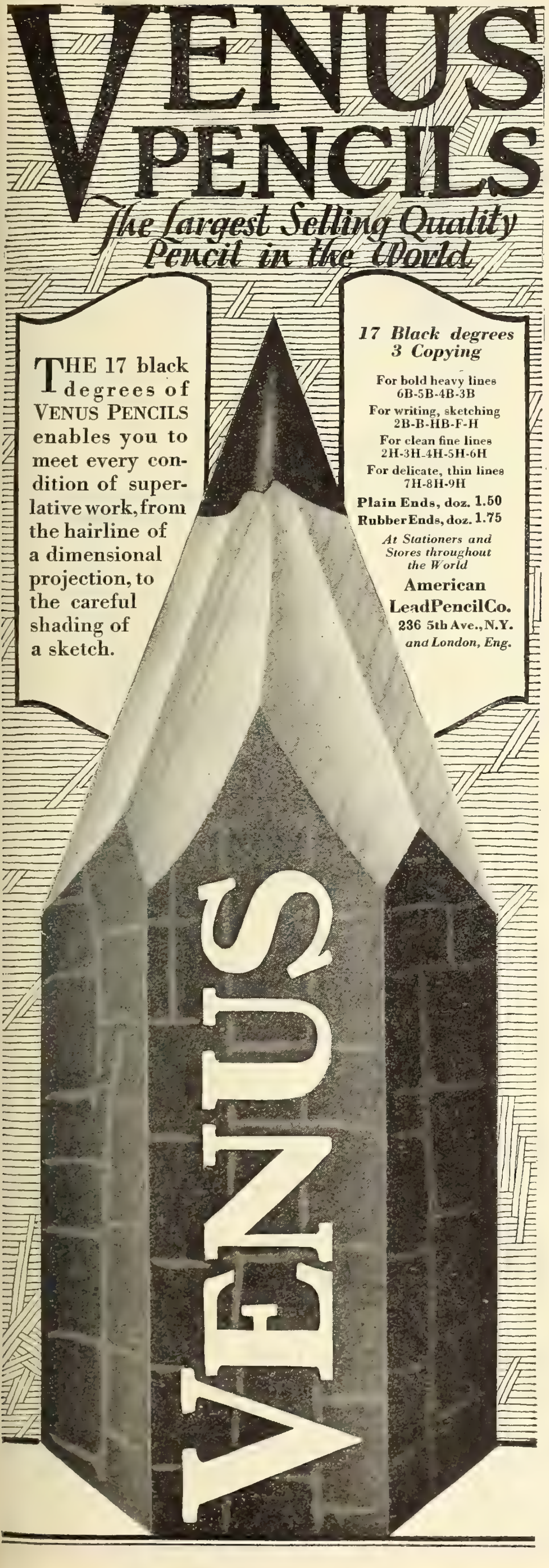

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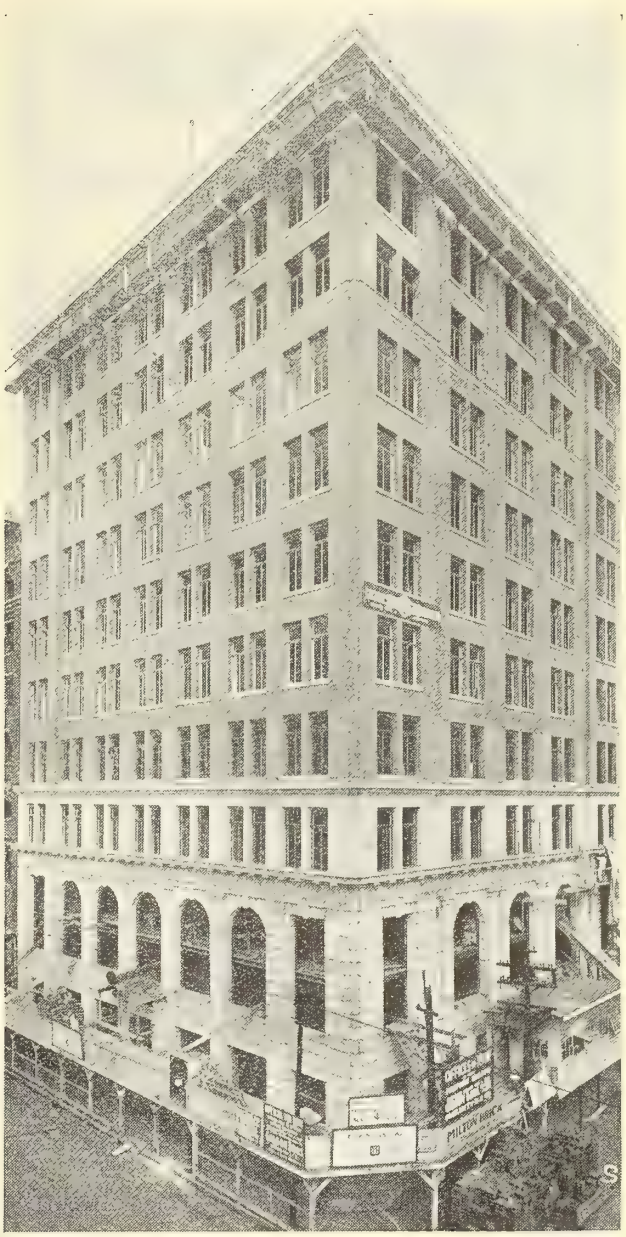

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For Blast Hole, Water, Shallow Oil and Gas Well Drilling and Mineral Testing

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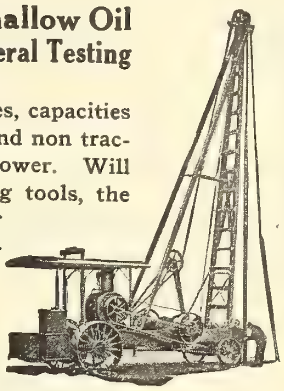

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The Underwriters' Laboratories say, in a recent report:

"The great value of interior walls and partitions as fire stops makes it essential that they be of materials, design and construction developing a high degree of fire resistance."

"The following 'R' (fire retardent) ratings for wall and partition constructions are based upon performance in the standard Fire Endurance and Fire and Hose Stream Tests which are judged equivalent to severe fire exposure conditions."

The Report Classifies

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2nd. Single 2 in. GUNITE WALL 1 hour rating.
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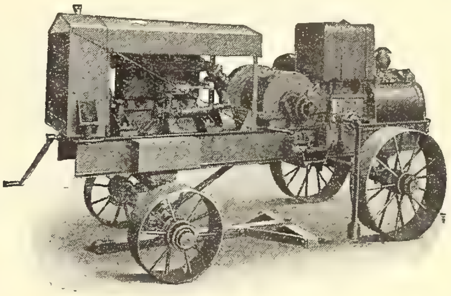

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1—Type O Thew steam shovel ⅝ yard dipper, traction wheels.
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your fire protection system to conform to Ontario Provincial Board of Health New Regulations?

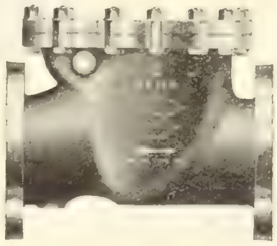

Fig. 481

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Jenkins
Iron Body "Special" Type
F. M. Swing Check Valve

and below a diagram showing correct method of installation.
These valves are approved by the Ontario Provincial Board of Health and are used for connections between a fire protection system having an auxiliary supply that is pumped and a municipal water supply.
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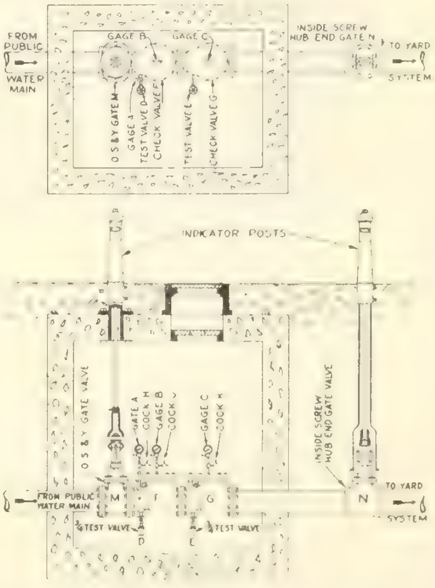

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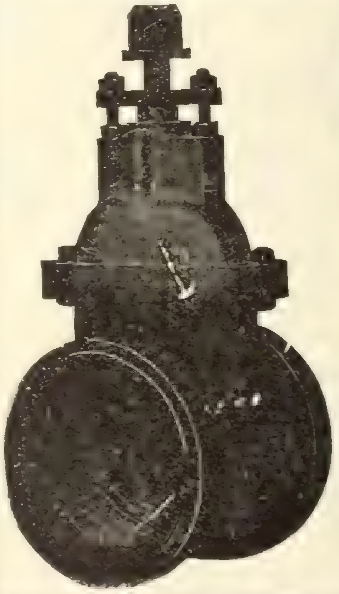

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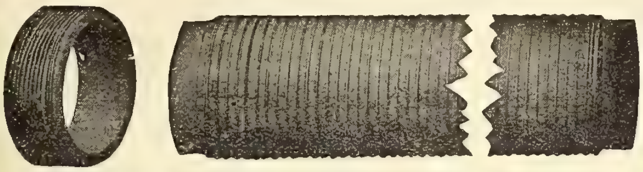

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Wire Wound Wood Stave Pipe
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from 16 in. to 12 ft. diameter

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Unexcelled in quality
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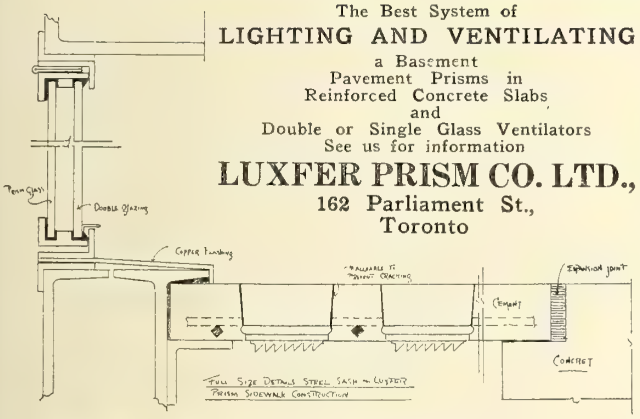
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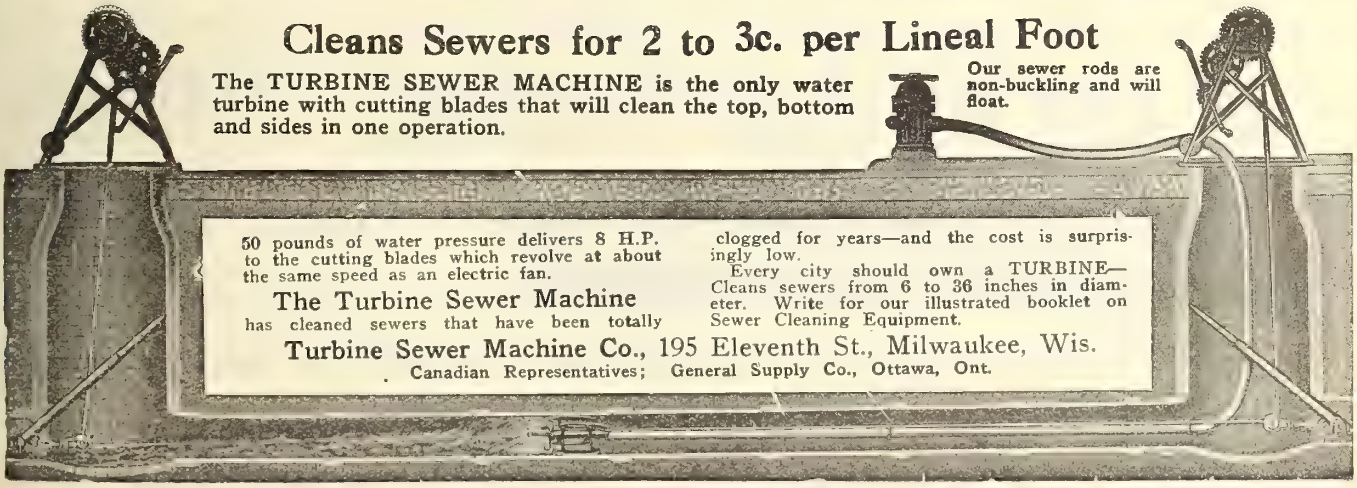

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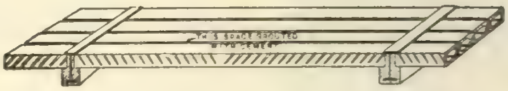

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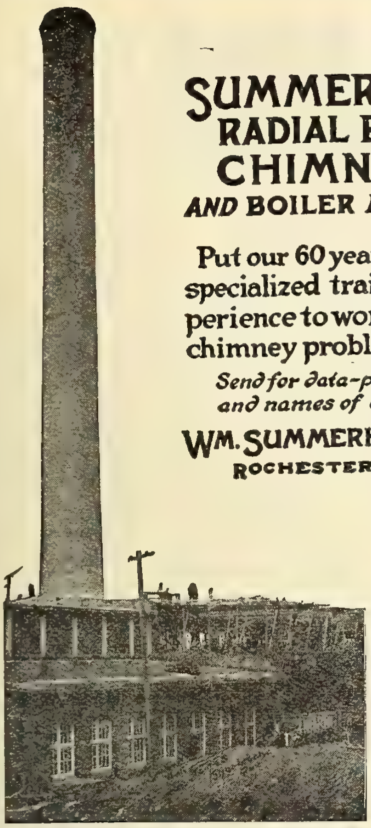

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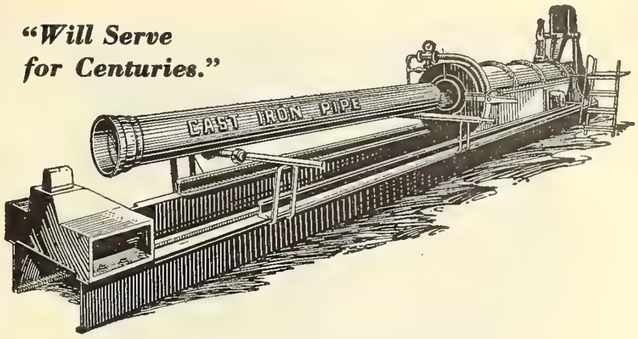

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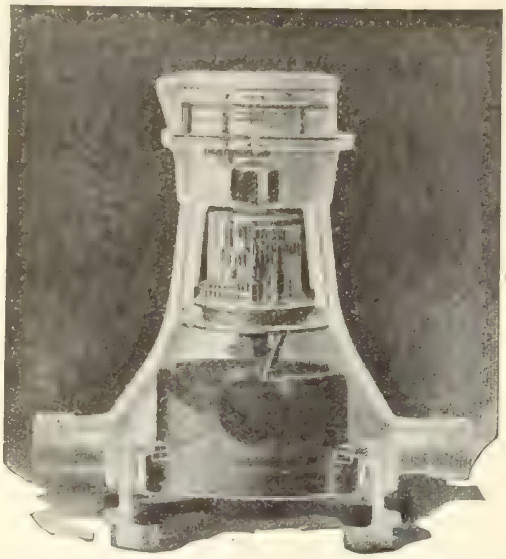

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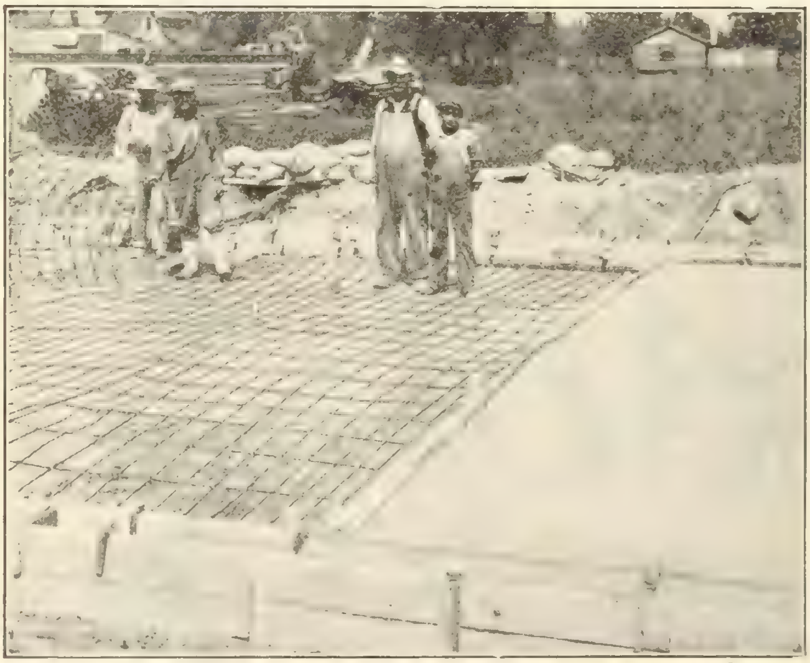

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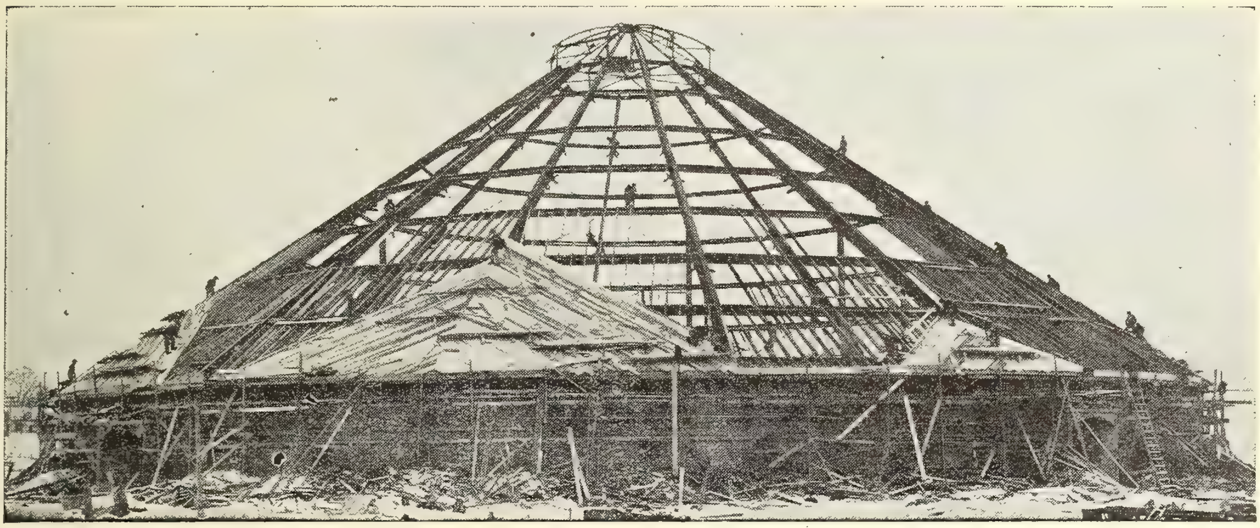

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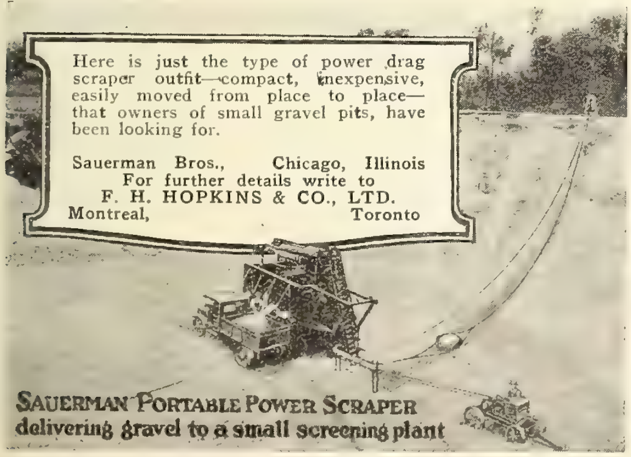

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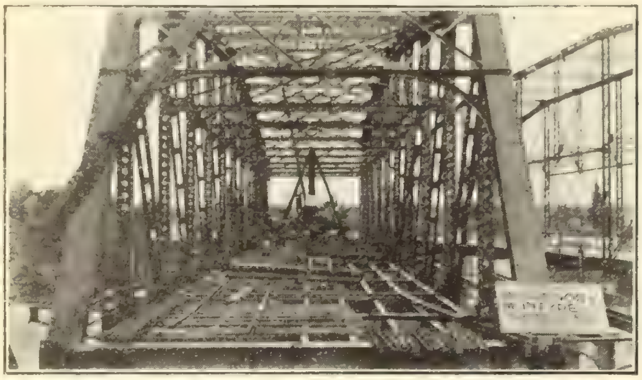

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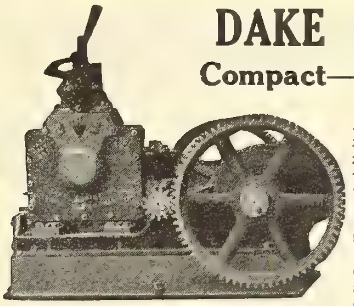

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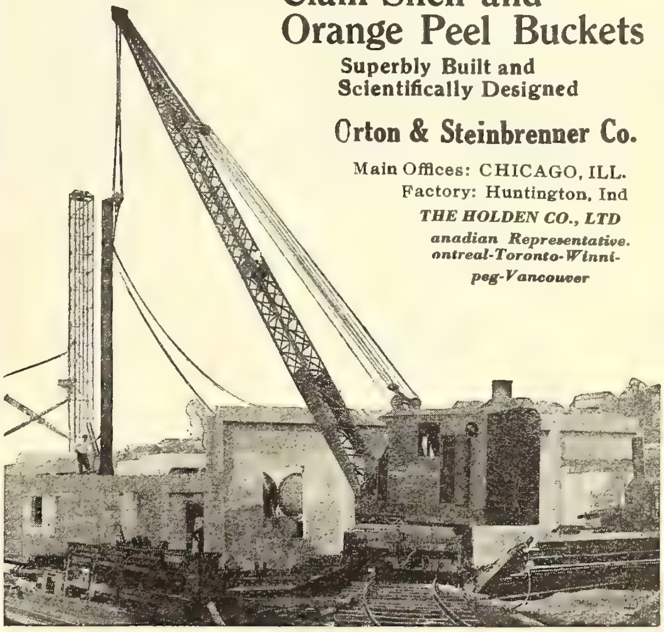

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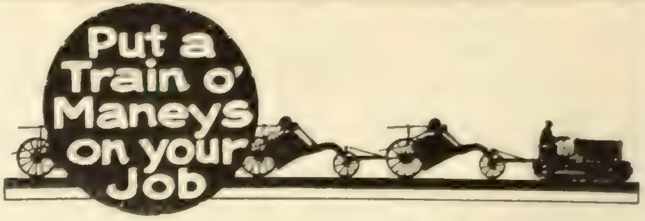
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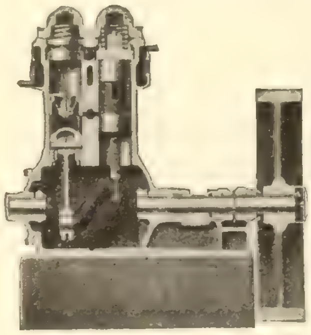

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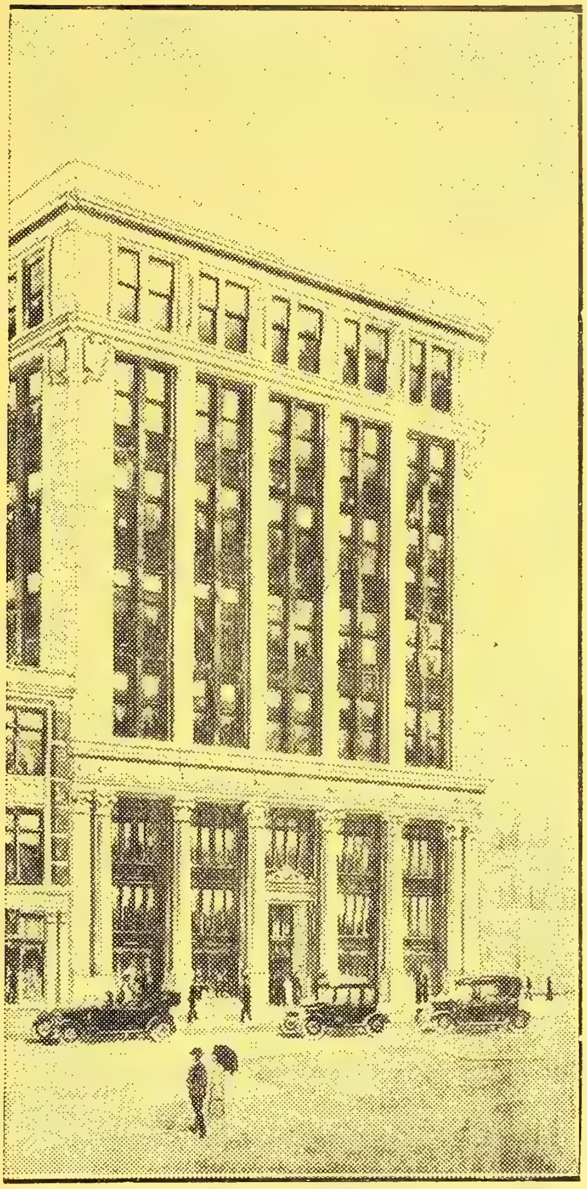

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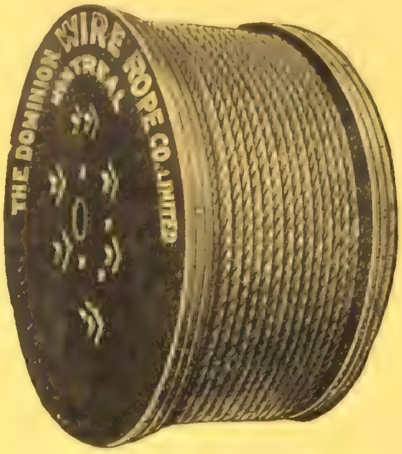

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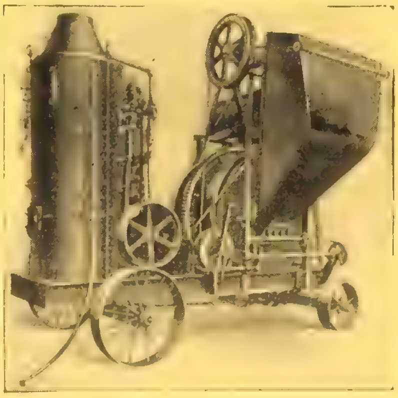

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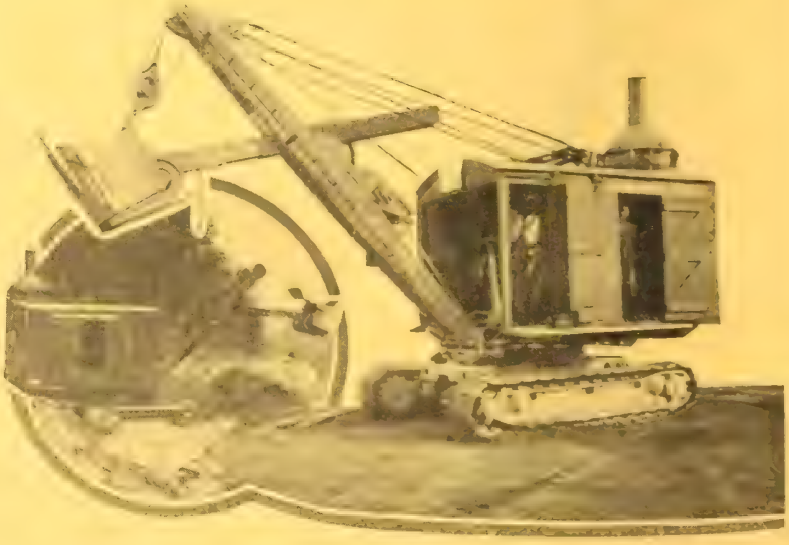

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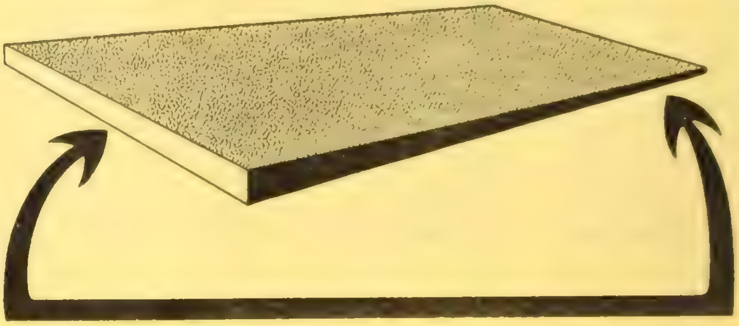

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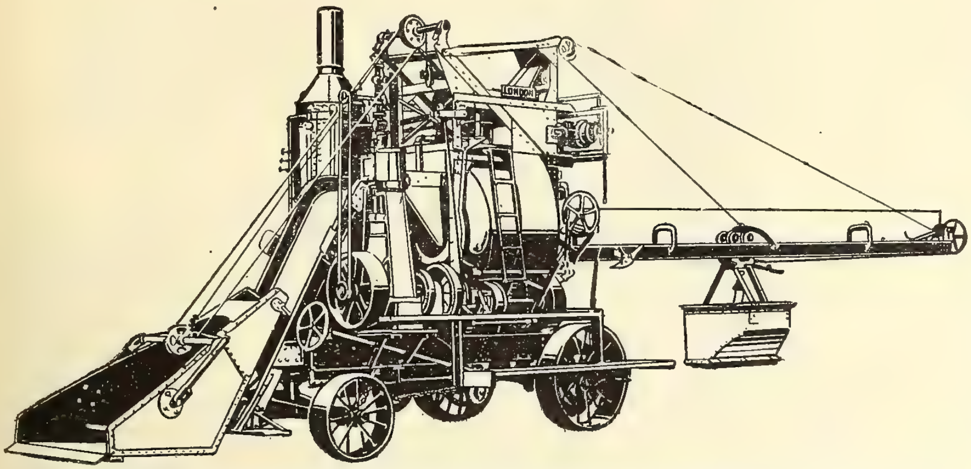

Fig. 16 B. London Paving Mixer. Made in two sizes with Rotary Delivery Chute and also with Boom and Bucket and full Creeper (Caterpillar) Traction. Described in Bulletin 49-K-B.

They are being specified by Engineers who know from experience that the first cost of a machine should not be the deciding factor when purchasing equipment.

We are demonstrating daily that our factory in London, Canada, produces machines that more than meet the competition of the world. Our foreign orders verify this statement. Last month a British engineering firm having a large Government contract in China, after much investigation, purchased TEN LONDON MACHINES ON ONE ORDER for shipment to Hong Kong. London Machines have an enviable reputation both at home and abroad.

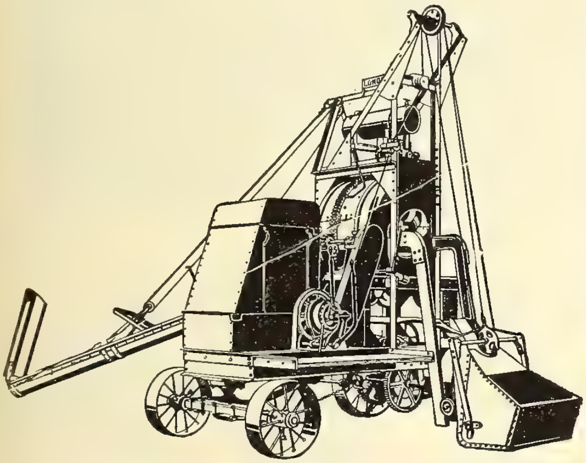

Fig. 801. London Traction Sidewalk Mixer. Travels along the street under its own power and deposits the concrete on the sidewalk while moving. Described in Bulletin 49-L.

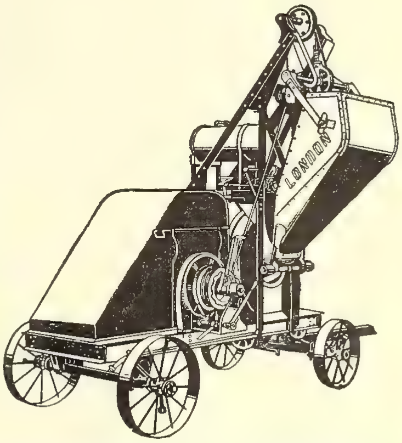

Fig. 33. London Heavy Duty Builders' Mixers. Built in five sizes with steam, gasoline or electric power. Described in Bulletin 49-F-1.

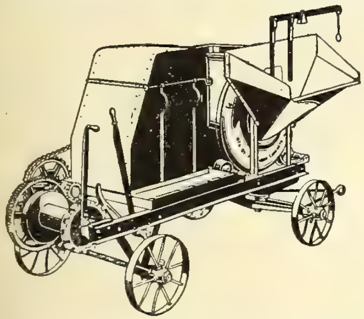

Fig. 25. London Combination Mixers. Built in two sizes. Two Machines in one. A Concrete Mixer and a real Hoisting Drum built into one unit. Described in Bulletin 49-D-1.

Made in Canada

We manufacture Concrete Mixers, Hoists, Air Compressors, Pumps, Brick Block and Tile Machines, Barrows, Carts, Silo Moulds, Ornamental Moulds and Tools.

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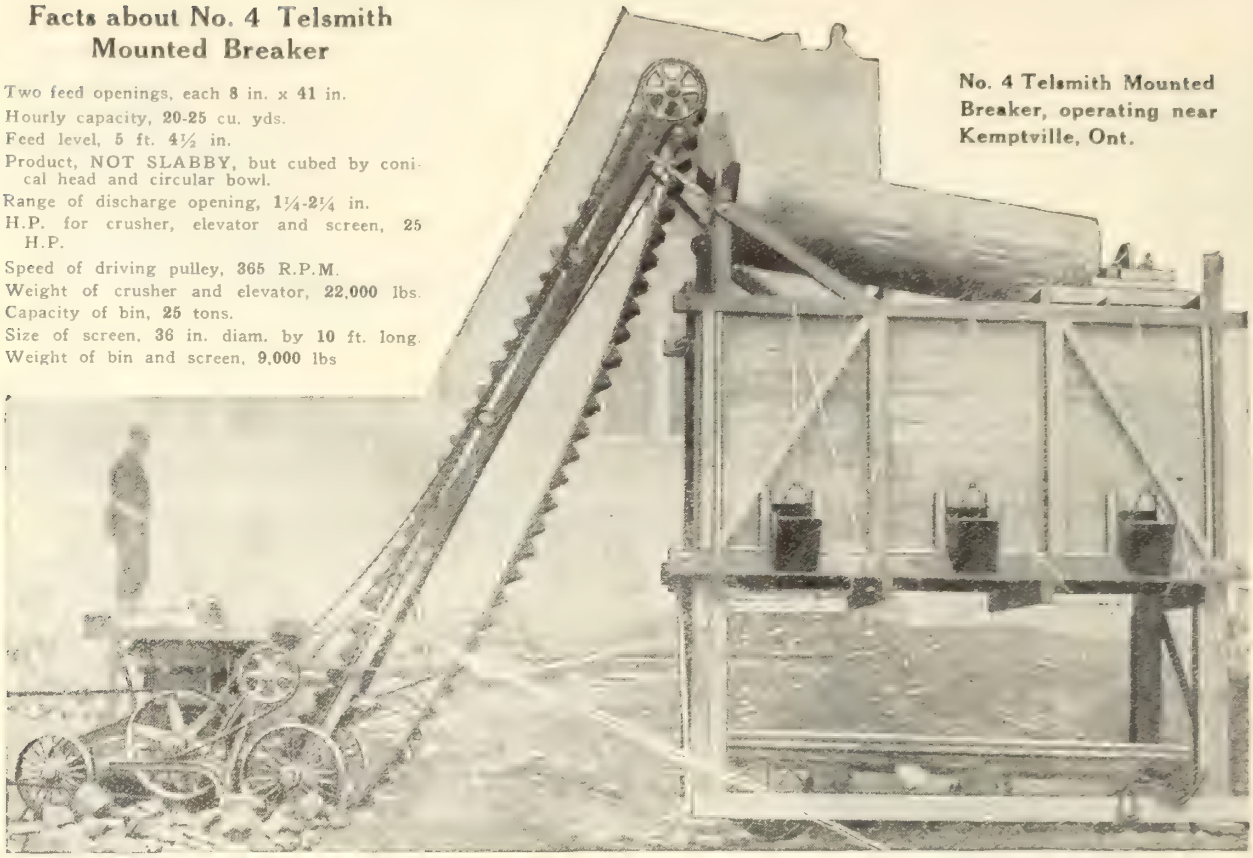
Facts about No. 4 Telsmith Mounted Breaker

Two feed openings, each 8 in. x 41 in.
Hourly capacity, 20-25 cu. yds.
Feed level, 5 ft. 4½ in.
Product, NOT SLABBY, but cubed by conical head and circular bowl.
Range of discharge opening, 1¼-2¼ in.
H.P. for crusher, elevator and screen, 25 H.P.
Speed of driving pulley, 365 R.P.M.
Weight of crusher and elevator, 22,000 lbs.
Capacity of bin, 25 tons.
Size of screen, 36 in. diam. by 10 ft. long.
Weight of bin and screen, 9,000 lbs



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The "Telsmith" Mounted Breaker is built in three sizes, Nos. 3, 4 and 5. Even the No. 3 will average between 100 and 150 cu. yds. in ten hours, while the No. 4 is good for 20-25 and the No. 5, 25-35 cu. yds per hour. Yet the largest of these outfits weighs less than 15 tons.

The feed level is extremely low—only 6 ft. 3 in. on the big No. 5 outfit. "Telsmith's" big receiving openings and parallel crushing stroke cut down sledging and block-holing in the quarry. The horizontal pinch grips the smoothest, hardest gravel boulders with very little slippage. One nip—and Mr. Rock is all through.

"Telsmith's" quality product is even more important than its big low-cost tonnage. The "Telsmith" conical head cracks up the flat rock, making a sound, strong, cubical product that will bond into the road and stand up under heavy traffic. The circular discharge opening counteracts the sprawling tendency of a stratified rock. "Telsmith" makes CUBICAL rock—not slabs.

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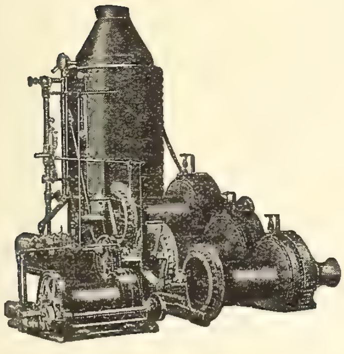

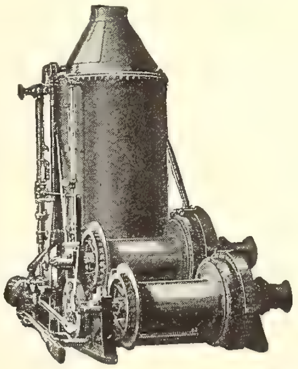

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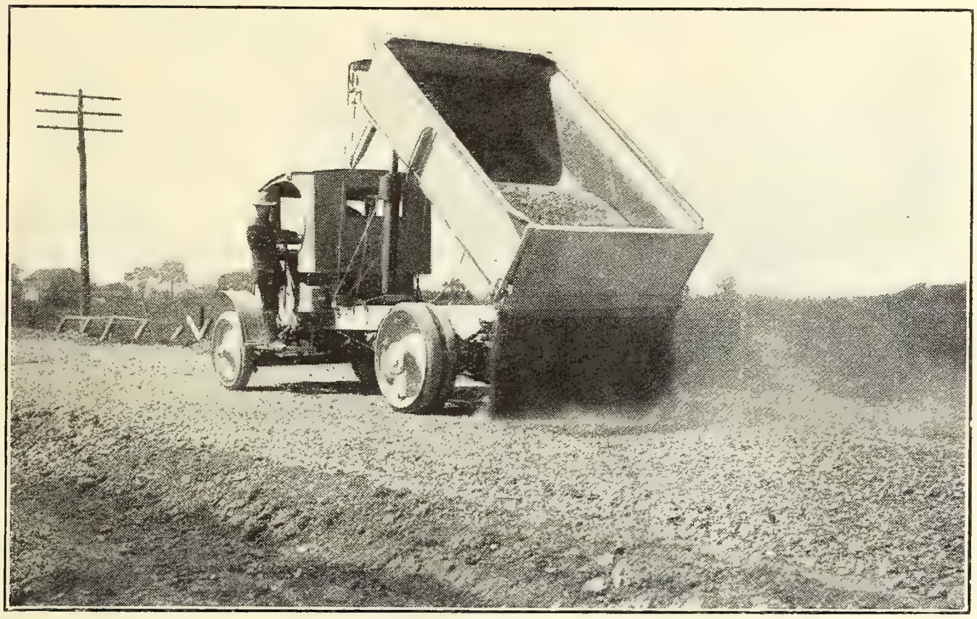

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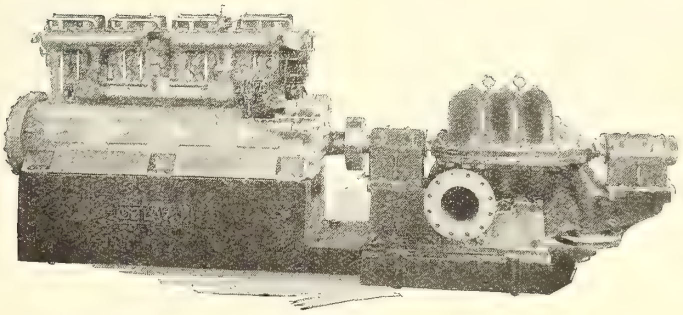

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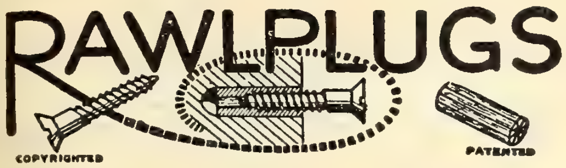

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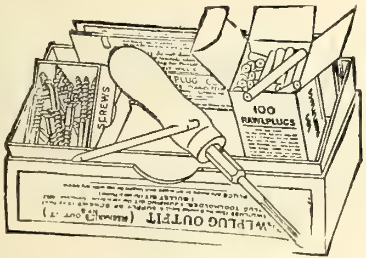

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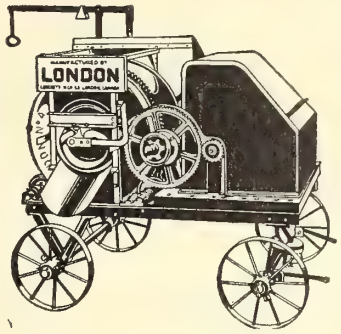

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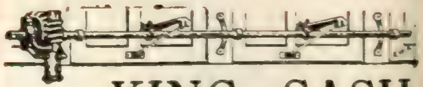
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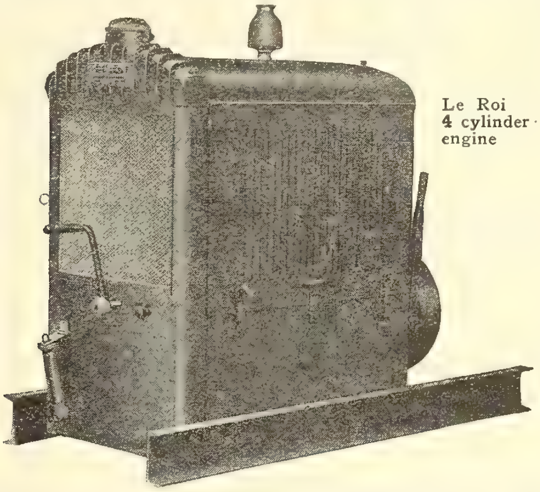

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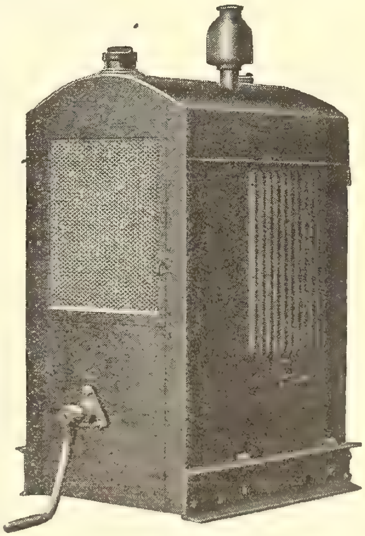

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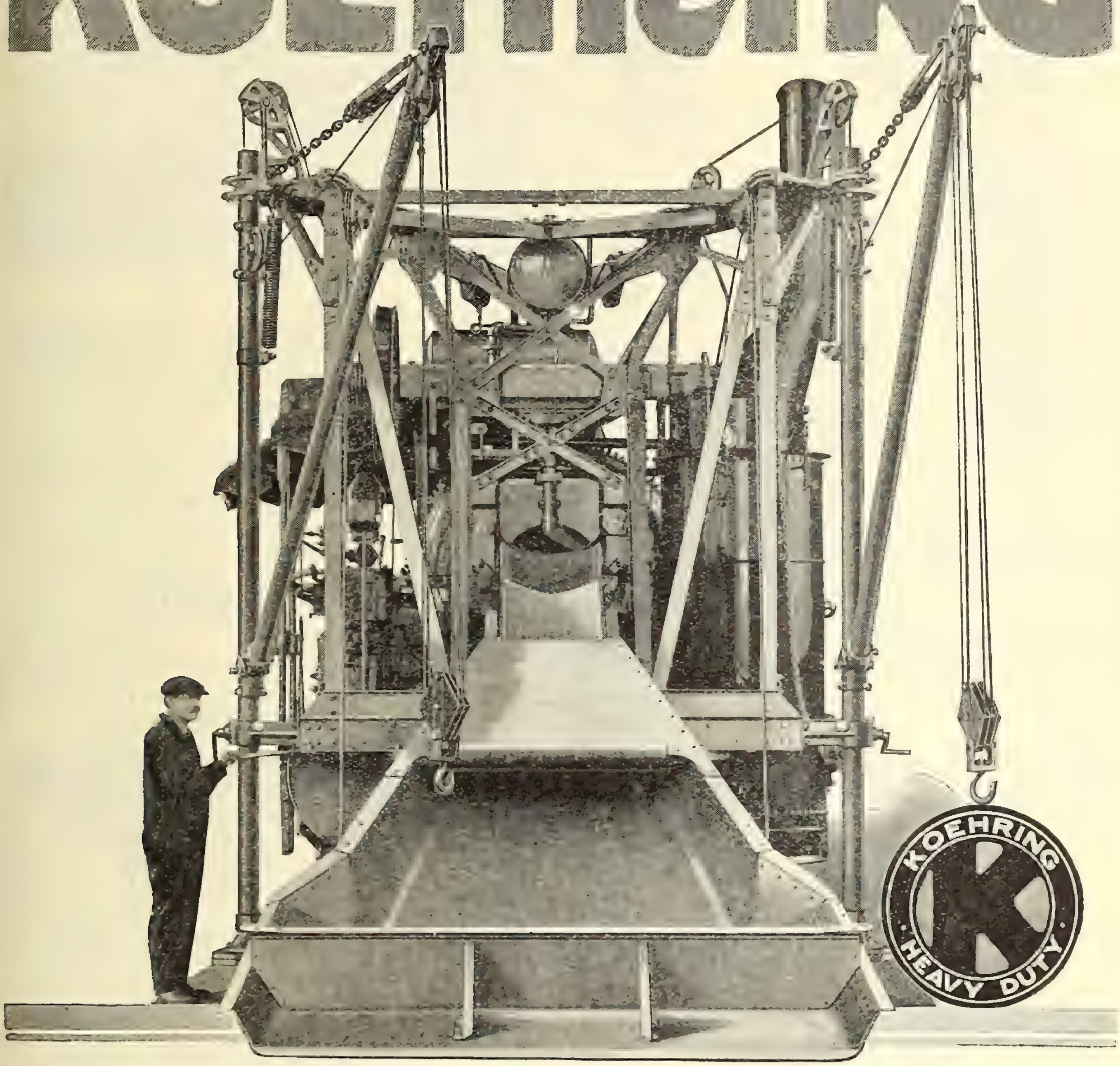

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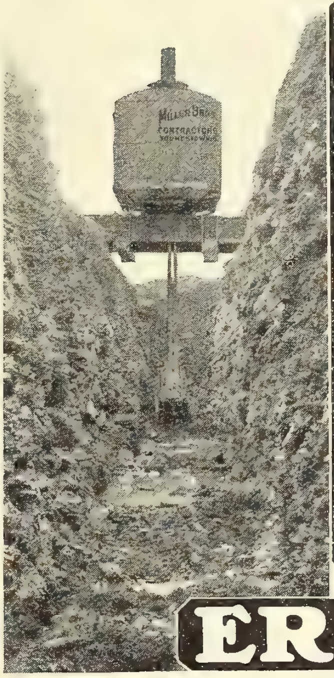

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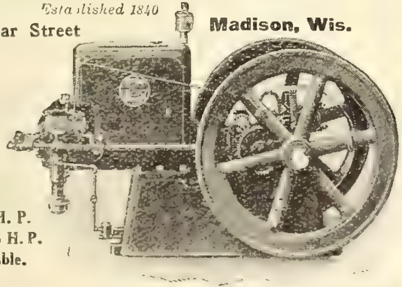

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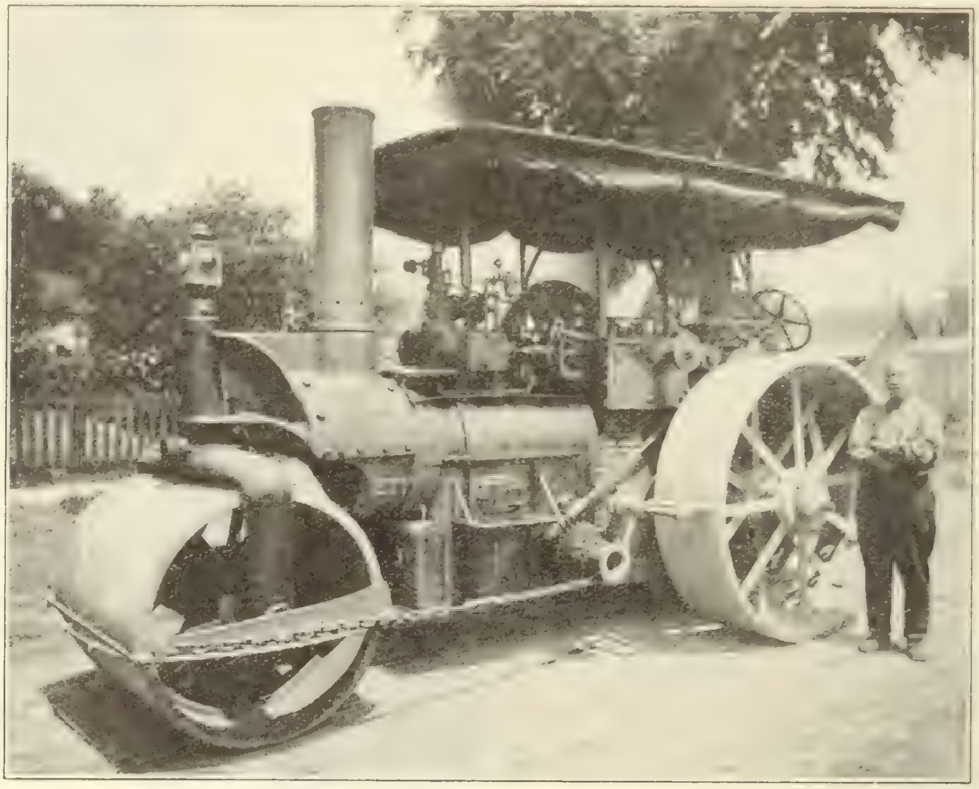

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At the Turning Point

A representative of the Babson Statistical Agency, Mr. W. R. Mattson, speaking before the recent contractors' convention in Quebec City said that while in the United States there was a distinct turn "for the better" about the middle of 1922, we in Canada are just about at the turning point. "Consequently" he adds "the outlook is much better than it was a year ago."

We in Canada are apt to lay a good deal of stress on the opinions offered by the Babson organization because it is generally recognized that they do not express an opinion without carefully weighing all the circumstances that seem to bear upon the question at issue. In this case the Contract Record is all the more willing to accept the Babson findings because they coincide with our own observations and printed statements. We have all along contended that 'normal' would not be reached before sometime in the first part of 1923 and though it is plainly evident that we are far from approaching a boom period it must be patent to everybody that we are largely recovered from the nightmares that have haunted us for so many years and are ready to invest something in the possibilities of the future. This has been demonstrated first in the stock markets throughout the country where practically every class of stock, but more especially industrial stocks, have shown appreciation—indicating the returning confidence of the investor. It is also generally recognized that industrial revival follows with certainty a few months after stock market revival. On this theory, also, 1923 should be busy.

Theoretically the stage is set for an active year. Whether or not price conditions—which are far from normal both in wages and commodities— and whether labor conditions of supply and demand, will allow the forward march of industry to take its natural course is not quite clear. It is not evident that the public is in a mood, or even able if they were so inclined, to freely pay present or higher prices for buildings and commodities. Let us hope, however, that this will not prevent healthy development but merely act as a safeguard against industry over-reaching itself.

Time to Build

During February, construction contracts actually awarded in Canada amounted to $13,311,800 compared with $10,718,300 in February, 1922. Residential building accounted for 21.4% of the February total and amounted to $2,854,000. Business building amounted to $6,363,800 or 47.9%; industrial building, $2,997,500 or 22.5%; public works and utilities, $1,096,500 or 8.2%.

In commenting on the building situation, MacLean Building Reports Ltd., state: "Spring will soon be here, and, in more pressing form than ever, the question of taking long delayed construction projects in hand. For municipalities with public utility extensions to instal, for business houses with office and manufacturing expansions in contemplation, and perhaps most of all for private apartment house dwellers and rent payers,, who have long dreamed of a certain little house of their own—for all of these the problem is—Build now or await further possible declines in costs? In reply to which a majority of considerations seem to suggest an affirmative answer.

"It is apparent that the great drop in construction costs is over and those who wish to build may do so in 1923 without fear of loss through the shrinkage of existing values incidental to rapid price deflation. Labour has settled down to a sound basis of production, and the flow of money into building channels is rapidly increasing. Many of the big projects underway have been undertaken only after the investor has come to realize that the major conditions in the building field are now favorable. There is much wisdom in the advice being given at the present juncture by architects to their prospective clients—"Build now and avoid the rush."

How May Compressed Air Illness be Reduced?

The Application of Compressed Air to Engineering Work Has Tended to Cause Bodily Effects, the Avoidance of Which Requires Careful Observation of Certain Rules—A Study of the Factors Involved

By W. G. CAMERON, B.A.Sc.
Assistant Engineer, Sewer Section, Department of Works, Toronto

In many places in Canada and the United States, compressed air has been used to aid in tunnel and other engineering work, such as sinking caissons for bridge piers and buildings. As a rule low pressures have been used, and consequently very little injury and very little physical inconvenience has been caused, but as we have now come to an era, when this aid to engineering has been generally recognized, we must expect it to be more widely used, and in the general course of events, high pressures must frequently be used.

In most of Europe, and in some of the large centres in the United States, this transition period has been passed and we find that in such places, rules and regulations have been drawn up controlling the use of compressed air. It has been found that many injuries and illnesses are caused by lack of care in its use.

Trouble Caused by Careless Decompression

Research was made, and as investigation proceeded, it was found that one thing was generally the cause of this trouble, i.e., carelessness in decompression. Later when autopsies were made, and other research had progressed, the reason for decompression being the cause of injury was found to be that the extra amount of compressed air which had been forced into the system, took the easiest way of escape from the body when decompression was too rapid. It collected in the veins, joints, and tissues, in the shape of tiny bubbles of nitrogen, which interrupted the proper natural functioning of these. This in turn caused intense pain, ruptured blood vessels, paralysis, vertigo and other unnatural conditions. Therefore, a means of combatting and controlling this evil was sought; rules were drawn up for controlling decompression, and to require that a person who developed unpleasant symptoms should immediately return to the former condition under which he had worked and be decompressed in a proper manner.

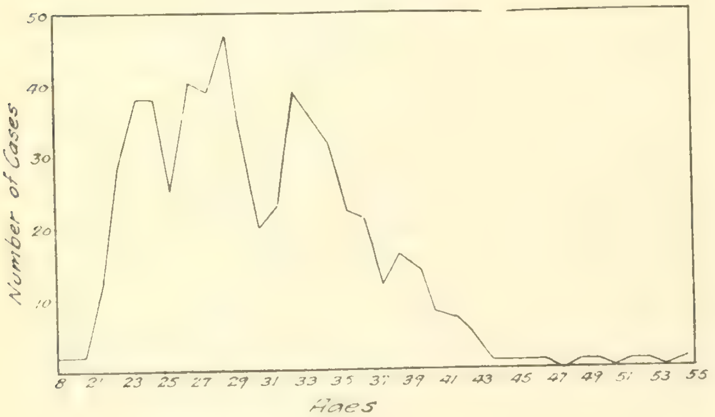


Fig. 1—Effect of age on compressed air workers

It is with the idea of giving a basis on which to form governing laws in unorganized places that the following rules have been drawn up. They are generally copied from the regulations of such places as New York state, where they have served very effectively to reduce the number of casualties.

No person should be allowed in compressed air without having first passed a physical examination.

No person should be allowed in compressed air over 15 lbs. gauge, even if he has had previous experience, for longer than a four hour shift. He should then be called on to pass a new physical examination before he is again allowed in the compressed air.

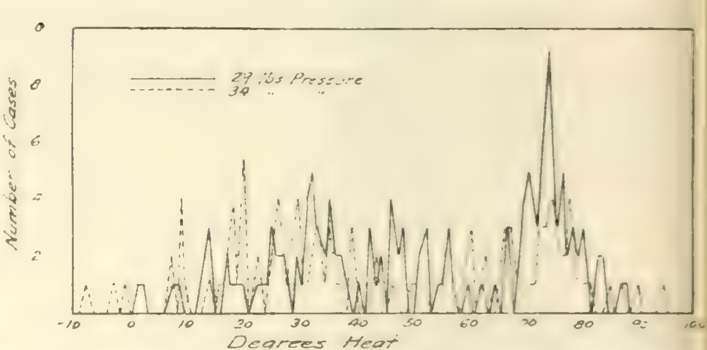


Fig. 2—Temperatures under which compressed air sickness occurred at 29 and 34 lbs. gauge pressure

Every employee in compressed air should have a physical examination at least every three months.

Each employee, after an absence, should pass a new examination before he is allowed in compressed air again.

For pressures over 15 lbs., a medical lock should be provided and one or more doctors or capable persons should be always in attendance. It should be the duty of such persons to keep a record of every man working in the compressed air, with length and number of shifts, pressure, examinations, etc. (Medical locks are generally built in the tunnel if the latter is large enough to accommodate them, but when it is not large enough, they are placed in some convenient place near the shaft.)

No person who uses narcotics or alcoholic beverages to excess should be employed.

No person should be allowed in compressed air over 15 lbs. gauge until he has passed a further physical examination.

No extra fleshy nor extra thin persons should be employed.

Proper gauges should be used (in each tunnel) accessible to the workmen.

Two connected air lines should be used.

The length of timber for decompression being very important, a competent person should always be in control thereof.

Valves, locks, etc., should be regularly inspected.

Doors of locks should have a glass peep hole or panel.

A valve should be placed on outside as well as inside of lock. (Outside means tunnel side.)

A second lock for pressures over 20 lbs. should be provided.

Tunnels (especially where compressed air is used) should be well ventilated and the compressed air should always be thoroughly cleaned of all foreign matter before entering tunnel or lock.

In pressures over 15 lbs. guage, the men should exercise during decompression.

Table 1—Time of Shift, Pennsylvania

When pressure is above normal but not above 21 lbs., 8 hrs. in 24 with 30 minute interval
When pressure is above 21 lbs. but not above 29 lbs., 6 hrs. in 24 with 1 hour interval
When pressure is above 29 lbs. but not above 34 lbs., 4 hrs. in 24 with 2 hour interval
When pressure is above 34 lbs. but not above 39 lbs., 3 hrs. in 24 with 3 hour interval
When pressure is above 39 lbs. but not above 44 lbs., 2 hrs. in 24 with 4 hour interval
When pressure is above 44 lbs. but not above 49 lbs., 1½ hrs. in 24 with 5 hour interval

Higher pressures to be regulated in like manner.

All shifts should be divided into two equal periods with time allowed for interval to be spent in normal air, and the interval should be between the two periods.

Table 2—Length of Decompression, Pennsylvania

When pressure exceeds normal but does not exceed 10 lbs. gauge pressure time 1 minute
When pressure exceeds 10 lbs. but does not exceed 15 lbs. gauge pressure time 2 minutes
When pressure exceeds 15 lbs. but does not exceed 20 lbs. gauge pressure time 5 minutes
When pressure exceeds 20 lbs. but does not exceed 25 lbs. gauge pressure time 10 minutes
When pressure exceeds 25 lbs. but does not exceed 30 lbs. gauge pressure time 12 minutes
When pressure exceeds 30 lbs. but does not exceed 35 lbs. gauge pressure time 15 minutes
When pressure exceeds 35 lbs. but does not exceed 40 lbs. gauge pressure time 20 minutes
When pressure exceeds 40 lbs. but does not exceed 45 lbs. gauge pressure time 25 minutes
When pressure exceeds 45 lbs. but does not exceed 50 lbs. gauge pressure time 30 minutes

All pressures above 35 lbs. to be decreased at the rate of 1 lb. per minute.

Table 3—Time of Shift, New Jersey

When pressure is above normal but not above 21 lbs., 8 hrs. in 24 with 30 minute interval
When pressure is above 21 lbs. but not above 30 lbs., 6 hrs. in 24 with 1 hour interval
When pressure is above 30 lbs. but not above 35 lbs., 4 hrs. in 24 with 2 hour interval
When pressure is above 35 lbs. but not above 40 lbs., 3 hrs. in 24 with 3 hour interval
When pressure is above 40 lbs. but not above 45 lbs., 2 hrs. in 24 with 4 hour interval
When pressure is above 45 lbs. but not above 50 lbs., 1½ hrs. in 24 with 5 hour interval

Table 4—Length of Decompression, New Jersey

When pressure exceeds normal but does not exceed 10 lbs. gauge pressure time 1 minute
When pressure exceeds 10 lbs. but does not exceed 15 lbs. gauge pressure time 2 minutes
When pressure exceeds 15 lbs. but does not exceed 20 lbs. gauge pressure time 5 minutes
When pressure exceeds 20 lbs. but does not exceed 25 lbs. gauge pressure time 10 minutes
When pressure exceeds 25 lbs. but does not exceed 30 lbs. gauge pressure time 12 minutes
When pressure exceeds 30 lbs. but does not exceed 36 lbs. gauge pressure time 15 minutes
When pressure exceeds 36 lbs. but does not exceed 40 lbs. gauge pressure time 20 minutes
When pressure exceeds 40 lbs. but does not exceed 50 lbs. gauge pressure time 25 minutes

Time to shift (table 3) as stated to be divided into two working periods of equal length with interval as stated between periods.

No overtime should be allowed in compressed air.

The temperature in the tunnel should be kept as low as possible and not over blood heat (98° F.)

Time of shift and decompression to be controlled and regulated according to these tables copied from the laws of Pennsylvania, with slight variations, as shown in Tables 1 and 2.

In New Jersey state the regulations vary somewhat from the above and are as shown in Tables 3 and 4.

No person should work in over 50 lbs. pressure unless it is absolutely necessary, and then only for very short periods.

In three states of the American Union, they have recognized the necessity of regulating the use of compressed air, but with these exceptions viz., New York, New Jersey, and Pennsylvania (whose rules are very similar) people have not awakened to the necessity of regulations.

No Laws in Canada

In Canada, although high pressures have been used in odd cases, and injuries caused and suffered by the use of compressed air, still they have not been numerous or frequent enough to call the attention of the public to the necessity of regulations anywhere in any province so far as is known. In the three states where laws do exist, they are controlled by the Labor Department, and inspectors appointed to see that the laws are properly enforced.

Experiments on compressed air uses and effects have been studied for many years by engineers and other scientists in European countries, but the engineers of New York have assembled and added to these experiments until the rules which they have drawn up seem fully efficient, and have to a large extent alleviated the serious nature of this great aid to engineering work.

Experiments are and have been made from time to time which but confirm the efficient rules of New York State.

Dr. Edward Levy, of the Bureau of Mines, Washington, has lately issued a complete report of his own observations and experiments and of the experiments and findings of engineers in various places such as Dr. Keays, Pennsylvania Railroad, Dr. J. S. Haldane, of England, engineers of the Transit Commission of New York, and engineers of the Board of Works in Great Britain.

The observations made recently by Dr. Edward Levy, Bureau of Mines, Washington, and tabulated in technical paper No. 285 were taken from some 680 cases. The illustrations given in this article were copied from his original curves, and depict more clearly than words his findings in each case.

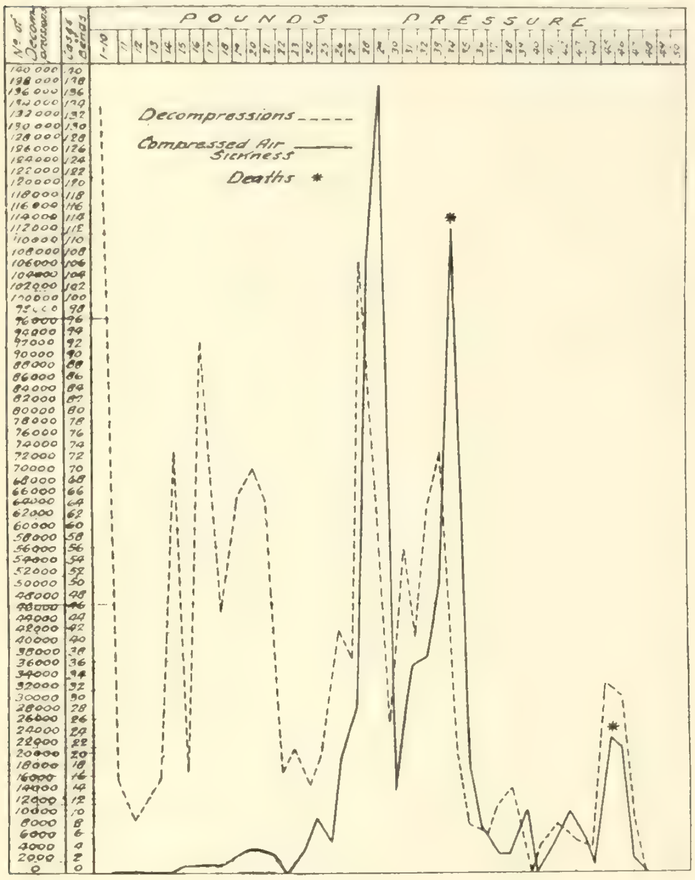


Fig. 3—Decompressions and compressed air sickness under various pressures in the tunnels built under the supervision of the public service commission, New York

Fig. 1 illustrates the effect that age may have on compressed air workers—108 of the workers did not report their ages correctly and their cases were not taken.

Fig. 2 illustrates the effect that temperature had on the workers at 29 and 34 lbs. guage pressure respectively. The full lines illustrate 29 lbs., the dotted lines 34 lbs.

Fig. 3 illustrates the number of cases under different pressures and decompressions.

Fig. 4 illustrates the length of time that elapsed after victims left air locks before they took sick.

Fig. 5 shows a reduction of sickness when the pressure is changed at 29 and 34 lbs. instead of 30 and 35 lbs.

As changes even from one pound must add considerable expense to some jobs, and as the increase in sickness, although considerable in numbers is only slight in effect (as the cases are only minor ones), it is a matter for debate whether the change should be made here.

It is still an open question what effect, and the extent of it, that continued exposure to compressed air over a period of time has on the human system: in short, what physical effect continued exposure over a period of years has. It is quite likely that most of our present cases only occur when the workers are run down physically, through having been exposed on previous work, and as a thorough physical examination will expose this, the rule in this regard should be rigidly enforced.

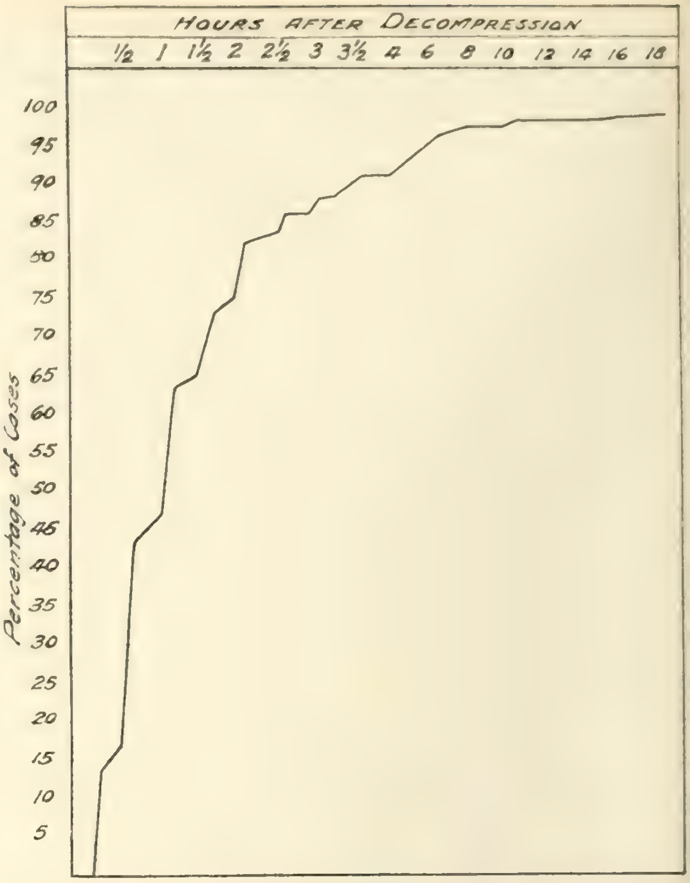


Fig. 4—Percentage of reported cases of compressed air sickness in relation to the number of hours after decompression before illness set in

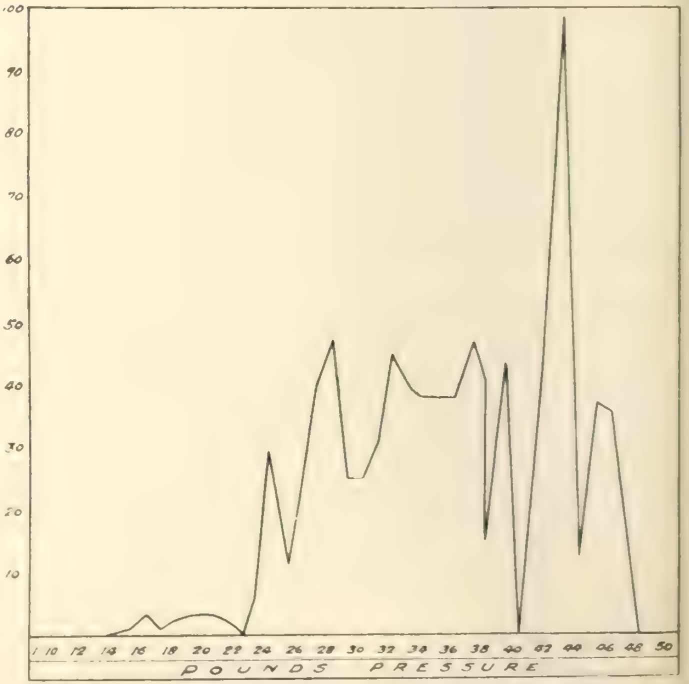


Fig. 5—Probable ratio of percentage of compressed air illness if the shifts had been changed at 29 and 34 lbs. instead of 30 and 35

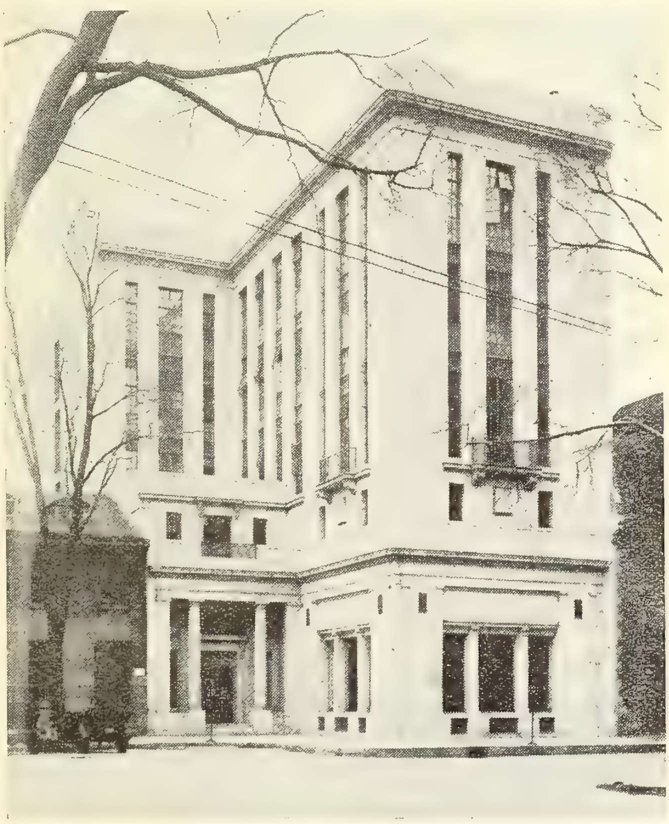
Recent Addition to Montreal's Uptown Commercial Colony

New Office Building of Crane Ltd. in Montreal is Very Imposing in Appearance—Of Structural Steel Design on Concrete Footings Carried Down to Hard Pan

Of recent years that part of the city of Montreal in the neighborhood of Phillips Square has attracted many concerns who have invested in large buildings. The latest addition to this colony is Crane Limited, who have just moved into a new building at 386 Beaver Hall Square. The building probably does not strictly belong to the large office building class as it is only 5 stories above street level and is occupied solely by Crane Limited. This company is engaged in the plumbing and engineering supply business and has a factory in another part of the city.

While it may not be of very large size, this new structure deserves special mention on account of its very graceful and imposing design and is a really fine addition to the group of buildings in the neighborhood. The design is particularly pleasing and has been brought out to best advantage by the very excellent cut stone work. This stone cutting was done by the Quinlan Cut Stone Company and placed by the general contractors, Anglin-Norcross, Limited.

The floor plan of the building resembles a rectangle with a smaller rectangle taken out from one corner. The main entrance on Beaver Hall Square, is in the part formed by this re-entrant corner. There is also an entrance at the other end of the building on Union Avenue which is devoted to local retail sales to customers who come in for their goods.



The handsome new office building of Crane Ltd., Montreal

A glance at the accompanying cuts will convey an accurate idea of the size of the building. All the space is occupied by Crane Limited and is allotted as follows: the basement contains display rooms, heating equipment for the building and a large stock room; the ground floor has more display space for other materials and the city sales stock room in the rear facing on Union Avenue; the first floor contains the more elaborate display rooms showing model bathrooms and bath room equipment also further space devoted to stock and fittings; the second floor has the executive and engineering departments; the third floor has the accounting, claims, order and billing departments; and the fourth and the last floor is devoted to traffic, purchasing, filing, mailing and stationery.

Type of Construction

The type of construction is particularly solid but withal very artistic. The foundations are of concrete on hard pan, supporting a structural steel superstructure of the self-contained type, with wall columns so as to have no wall bearing beams. The two front walls are of finished Montreal limestone with common brick backing furred with terra cotta tile and finished with plaster to which has been applied a coating of waterproof paint. The two side walls are of Streitsville face brick supplied through David McGill, Esq., of Montreal, and completed as described above. All trim around the windows and doors in the side walls is of finished Montreal limestone to correspond with the front walls. The exterior windows in the two front walls on Union Avenue and Beaver Hall Square, are of the metal casement type manufactured in England and supplied through David McGill, Esq., Montreal. These windows are of very pleasing design and appearance. The roof is a Barrett specification roof laid by a local roofing contractor, Douglas Bros. The general contractor was Anglin-Norcross Ltd.

The floors are mainly of terra cotta tile with the exception of the ground floor and basement which are of reinforced concrete. These terra cotta floors were supplied by the National Fireproofing Co., Ltd., of Toronto, and are of the flat-arched type. They were placed by the general contractor. On top of this tile floor, a thin layer of concrete was laid and leveled to take a special type of rubber-flooring resembling marble in its appearance. Two classes of this surface material were used, the heavier quality being used in the display room and on the stairs connecting the floors. It was supplied and laid by the Stedman Products Company of South Braintree, Mass., under a separate contract with the architect. It presents an unusual but quite favorable appearance and has the advantage of being very durable.

It is practically unknown in this locality except that it has been used with great success in the Royal Victoria Hospital and has proved to be extremely useful in hospitals, public lobbies, etc., where durability and nice appearance are both desired. It also possesses the added advantage of being noiseless under foot.

The interior partitions are of terra cotta tile furnished by the National Fireproofing Company and erected by the general contractor. The steel columns are also fireproofed with the same material so that the building is practically fireproofed throughout. All interior partitions have a coat of plaster applied direct to the tile and finished with an application of waterproof paint. On the second, third, and fourth floors this paint is of a light buff color from the chair rail to the ceiling and a reddish-brown between the chair rail and the baseboard. The ceilings are all tinted white.

In the basement, the interior walls are brick with tile furring and plaster applied to the side of the wall in the display room. In the stock room, the brick wall was brushed with a mixture of neat cement grout and a coat of whitewash applied. There is also a concrete wall around the freight elevator shaft which runs from the basement up to the first floor to serve the various stockrooms.

The display room on the ground floor has a dado about 3 ft. high of black and gold marble of beautiful color and finish which gives the room a very finished appearance. On the first floor in the display rooms a special type of synthetic tile has been used to form a dado 6 feet high. This is manufactured by the Zenitherm Co. Inc., of New York City and will prove to be the best kind of partition under the circumstances as it holds nails or screws and can be quickly patched when a fixture is removed. Other special tiling has been used in the model bathrooms on this floor.

The electric lighting system throughout has been carefully installed and follows the principle of providing plenty of illumination of the direct-indirect type. This gives a restful appearance to objects under this class of illumination. The fixtures themselves are of a very handsome design and it appears that the electrical work has been properly designed along scientific lines.

The wood trim throughout is of quarter-cut oak including doors, baseboards, chair rail, etc. All furniture is of the same material, finished in a highly polished light color.

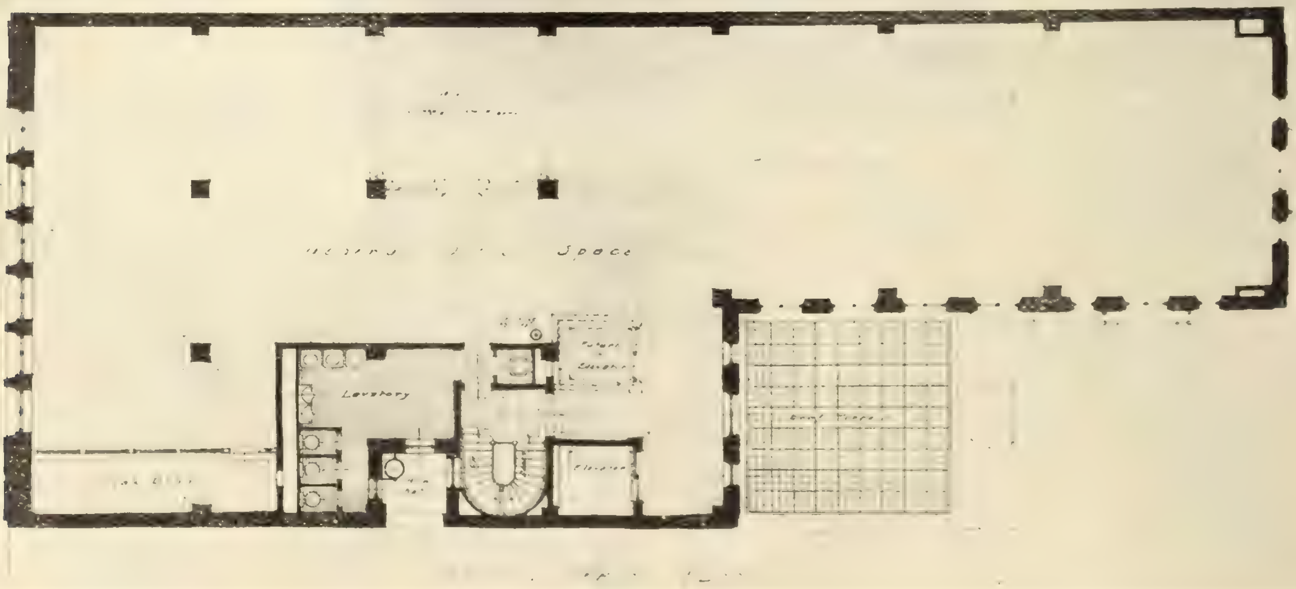
The stair-well is adjacent to the elevator shaft and contains an ornamental iron staircase with concrete treads and risers, the treads being surfaced with the rubber flooring mentioned previously. At each landing on the second, third and fourth floors there is a lavatory.

The general impression which one obtains upon an inspection of the building is one of extreme comfort in working conditions combined with economy of space. The display rooms are designed more particularly to impress one with the beauty and comfort obtainable in a modern bathroom and no expense has been spared to attain this object.

Construction Procedure

Bids were called by Mr. Hugh Vallance, the architect in October, 1921, and the successful bidder was Anglin-Norcross, Ltd., Montreal, who at once arranged for the demolition of the buildings occupying the site. This work was finished a short time later and excavation was then started and continued by hand, the men throwing the spoil directly into the bottom dump wagons. A wooden ramp at each end of the site served as entrance to and exit from excavation.

This work was soon completed down to about elevation 85, street level being at elevation 100.00. At elevation 85, a layer of hard pan was encountered which was considered good enough to withstand any pressure liable to be brought on it in this building. The allowable soil pressure was taken as 6.000 pounds per square foot. The sub-grade elevations of the footings vary slightly according to the amount of load which they are intended to carry, which in



Plan of a typical floor in Crane Ltd's. office building turn determine their size and thickness. The construction of the concrete footings was commenced as soon as the general excavation was finished. These foundations are of standard spread footing type, reinforced concrete four way reinforcing. There are 8 interior column footings of various sizes and 20 exterior or wall columns footings supporting the steel superstructure. This design is quite common and involved no radical engineering problems. The walls of the two adjoining buildings had to be underpinned to ensure their future stability, and this was done by enlarging the footings and running a concrete supporting wall up to the old foundation. Foundations in the new building are all designed to carry an extra storey should it become necessary. The exterior walls are of reinforced concrete up to street level where the cut stone commences.

Following the completion of the foundations the Dominion Bridge Company came on the site to erect the steel superstructure frame. This is of the self-contained type with wall columns, to obviate the necessity of using wall-bearing beams. While this work was going on the general contractor was organizing his force to carry on with the rest of the building.

Winter weather had arrived by the time the steel was erected, so that it was considered advisable to put on roof as soon as practicable in order to afford as much protection as possible to the workmen in other parts of the building. The floors were then started from the top down, so that each one would serve as protection for the floor below during erection.

In the meantime the outer walls had been started so that the building was very soon closed in up to the third floor and shortly afterwards right to the top. Work then proceeded on the interior construction and was carried on under favorable conditions to completion.

The following contractors were engaged on the work: General contractor, Anglin-Norcross, Limited; roofing, sheet metal and fire doors, Douglas Bros; marble and tile, Smith Marble & Construction Co.; ornamental iron, John Watson & Sons; plumbing, heating and ventilation, John A. Gordon; ornamental bronze and brass, Robt. Mitchell Co.; electrical work, Canadian Comstock Co. Ltd.; elevators, Otis-Fensom Elevator Co.; painting and glazing, general contractor; plastering, McNulty Bros; mill work, Wm. Rutherford & Son; cut stone, Quinlan Cut Stone Co.; floor surfacing, The Stedman Products Co., South Braintree, Mass.

Material was furnished by the following: National Brick Co., common brick; Streitsville Brick Co., David McGill, Esq., face brick; plate glass, Hobbs Mfg. Co.; floor surfacing, the Stedman Products Co.; exterior windows, Henry Hope Co., of England, (Montreal agent, David McGill.)

The above information was obtained by our Montreal correspondent from Anglin-Norcross Ltd., general contractors, and Mr. Hugh Vallance, architect for the building.

In some cities it is now the practice for the engineering department in recording the cost of pavement repairs to keep the cost of repairs to the base separate from that of the surface layer. In this way a more accurate comparison of the merits of paving surfaces can be secured.

Letters to the Editor

Further Discussion of Concrete Proportioning Theories

Saskatoon, Feb, 23, 1923

Editor, Contract Record:—

The writer feels that some further explanation is due to the readers of the "Contract Record" who may be interested in the proportioning of concrete in connection with the letter discussion furnished by R. B. Young in the Dec. 13, 1922 issue, which commented on the writer's article, "Some Fallacies in Concrete Proportioning Theories," as published in the Oct. 11, 1922 issue.

While not intended to be "dogmatic" it was not possible in the original paper to include test data, either those presented when the first criticism was made in June, 1919, or additional data which were obtained in the years following. It was therefore necessary to make rather brief and condensed statements, but references were included to earlier discussions which, if referred to, would give any one interested a complete story of the controversy over the recently proposed proportioning theories.

For the benefit of those engineers who are interested in concrete proportioning methods the writer would like to clearly state the basic points involved in the controversy and to suggest a few tests which can be made in any laboratory, to demonstrate the truth or fallacy of his claims. The surface area theory of proportioning was presented in 1918 and the fineness modulus, or water cement ratio theory in 1919, as Mr. Young states. The first theory claims that the strength of concrete will be found proportional to the ratio of the quantity of cement in the mix to the surface area of the aggregate. A formula for calculating the quantity of mixing water required to result in mortars or concrete of the same consistency was also furnished. The second theory claimed that when the same quantity of cement was combined with equal quantities of different aggregates varying in gradation, but having the same fineness modulus, the same quantity of mixing water would in each case result in the same consistency and in turn equal compressive strengths would be obtained.

Basis of Criticisms

Complete data as to gradations and proportions employed were given by each as proof of the theories. The writer's original criticisms of these theories based upon repetition of tests of the mortars and concretes offered to support the theories may be briefly summarized as follows:—

1. While it was definitely stated by the advocates of both theories that concretes should have the same consistencies to be comparable, this necessity was disregarded in the tests made public by both. The water formula proposed for the surface area theory furnished mortars having **widely different** consistencies. The water formula in the fineness modulus theory also furnished concretes which had marked different consistencies. Contrary to the claims, equal consistencies could not be obtained when the concretes used in "establishing" the theories were repeated.

2. Disregarding the necessity for equal consisten-

cies in order that concretes might be compared, the compressive strengths which resulted were not proportional to the ratio of cement to surface area of the aggregate in the first case, nor were equal strengths obtained for concretes in which the fineness modulus and the water contents were the same.

The foregoing conclusions resulted from reproduction of the mortars and concretes employed by the proponents of the theories as well as for other concretes which were designed to fulfil the requirements of both theories.

It will not be difficult for any laboratory to independently determine the facts in the case by carrying out the following tests as outlined.—

1. Test of the surface area theory—Prepare mortars with sands C, E and G as shown in Tables V and VII. (Can. Eng., July 4-11, 1918). These are representative of the variation in surface area of the group of 9 sands. Note that the quantity of mixing water furnished by the water formula results in a constant water cement ratio. Also note that the formula is inadequate to give a plastic workable consistency for all mortars and that equal consistencies are not obtained as claimed. Consistencies should be determined preferably by means of the flow table, or if not available by means of the cylinder slump test. Then disregarding the limitations of the water formula **add** sufficient water to the drier mixtures to bring all to the **same** consistency and prepare compression test specimens for test later. Finally note the variations in compressive strength which result.

2. Test of the water cement ratio theory. (See Bulletin No. 1 of the Lewis Institute for gradations of aggregates, water formula, etc). Screen sufficient aggregate in general use in your district into the various sizes by means of Tyler sieves. Recombine these aggregates so as to obtain aggregates No. 40. 264, 271, 274, 278 and 280. These aggregates are representative of the 27 aggregates included in table 2 of this bulletin. Prepare concretes with one part of cement to 5 parts of aggregate by volume. Use the water formula No. 4, on page 13 and note that equal quantities of mixing water are given to each batch. After mixing, determine the consistency and note the variations among the group. If the theory of proportioning is correct, the same consistencies should result for all. Note in table 2 the wide variations in cement content per surface area of aggregate. Here is seen the fundamental difference in the two proportioning theories. **By the "surface area theory" wide strength variations would be expected. By the water cement ratio theory the same compressive strengths are predicted.** Note that the water formula makes no provision for the great variation in surface areas of the aggregates, yet it is universal experience that a fine aggregate requires more water than a coarse aggregate to result in the same consistency.

Additional experiments which would point out the inadequacy of both theories might be outlined, but the two included above should be sufficient. The first and controlling criticism of both theories is that the requirement of equal consistencies for concretes which are compared is ignored in the actual tests which are advanced to support the theories. The regrading of the aggregates as outlined and their combinations with cement to form mortars and concretes, followed by measurement of consistencies actually obtained will justify the writer's "expression of doubt as to the authenticity of the data on which they are based," and fully justify his claim "that sound principles of testing were violated in obtaining the data."

The "authenticity" of the test data and the "violation" of testing principles are matters which can be checked up by any one who has a set of testing sieves. It is a question of fact which can be determined by test and the fact that other critics have not made their criticisms known to the public should not necessarily carry weight.

Other Criticisms

However the writer is not alone in making public his criticisms as Mr. Young might lead the reader to believe. Professor Talbot, who as one of the pioneer investigators of the problems of concrete and reinforced concrete has directed the experimental work at the University of Illinois, refers to table No. 2 of the Lewis Institute Bulletin No. 1, as follows:—

> "Taking those aggregates of this table that come down to a workable basis for concrete, our tests with this material of the same sieve analysis indicate that the water content required to produce a given consistency or mobility for the aggregates with the higher surface areas given in this table, is 25% more than that required for those aggregates having only one-third as great surface area, the fineness modulus being the same in both cases. Using the same amount of water for aggregates of the same fineness modulus as was used in the tests reported in this table, there is quite a difference in strength; if the same mobility and a consequent varying water content had been used, the discrepancies in strength would have been much greater."

And later in further discussing the water cement ratio theory he states:

> "...... the tests referred to indicate that the use of a water content based upon fineness modulus, ..., does not give concretes of the same mobility with aggregates which vary in surface area but have the same fineness modulus."

The above quotations are taken from Vol. XIX. Proceedings of the American Society for Testing Materials.

In Bulletin No. 2, 1921, Section No. 6, School of Engineering Research, University of Toronto, Professors Gillespie and Duff make the following statement which has direct reference to tests made in connection with a study of the water-cement ratio theory of proportioning:—

> "Apparently there is no precise relation between strength and water cement ratio, but rather a general tendency for the strength to increase as the water-cement ratio diminishes. Referring to the three ordinates (Fig. 3) where the ratio is .65, .8 and 1.0 it will be seen that the strength may vary 100% or more above a minimum."

The foregoing quotations are fully in accord with the writer's original criticisms of this method of proportioning.

New Generators for Chippawa Plant

The Hydro-electric Power Commission of Ontario have awarded a contract for three further generators at their Chippawa Plant. This will make a total of eight with a capacity of well over 400,000 h.p. Of the three new generators one is being supplied by the Canadian Westinghouse Company and two by the Canadian General Electric Company.

Data on Pacific Drainage

Water Resources Paper No. 35, issued by the Dominion Water Powers Branch, Department of the Interior, Ottawa, compiles data relating to stream flow in British Columbia and Yukon, draining into the Pacific Ocean. Its author is R. G. Swan, district chief engineer of the Water Power Branch.

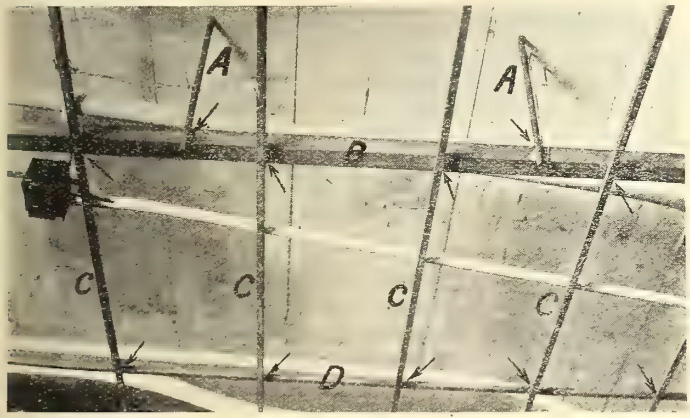
Something New in Building Construction

Steel Work Carrying Suspended Ceilings in Toronto Office Building Fastened by Arc Welding Process—Strength and Rigidity are Features of the Work—One Welder Averaged 1100 Welds Per Day

A concrete construction, seven-storey building which embodies some special features is being erected at 86 Bloor Street, West, Toronto, by Professional Offices, Ltd. In this building, the ceilings are of the suspended type, the space between the concrete floors and the plaster ceilings being about fourteen inches. One entirely new feature in construction is that the whole of the steel work for carrying the suspended plaster ceilings is fastened in place by means of the electric arc welding process, instead of by the usual method of "wiring."

Rows of 3/8 in. diameter round hangers are set in the concrete floor, as shown at A, in the illustration, the rows being 5 ft. apart. 1½ in. by 1½in. angle irons, B, are welded to the hangers and bars of ½ in. square stock, C, are welded to the angles, 12 in. apart. A ½ in. square bar, D, runs parallel to the angles halfway between the rows of hangers. Arrows indicate the location of welds. The metal lath is then wired up to the ½ in. square bars in the usual manner.

The job was in the nature of an experiment, in that none of those concerned had any knowledge of a similar, previous application of electric welding to building construction. The big problem was whether it could be done without adding to the cost of the building, and the answer could only be found by doing the job. The work was carried out by the Lincoln Electric Co., who regard themselves as pioneers in the arc welding field and who make a business of finding and developing new applications of the process.



Welding ceiling construction electrically. Arrows indicate points of welding

This company state that the job is an unqualified success. The ceilings in this building are going to be the strongest and most rigid ceilings of this type ever put up. The bars are welded together at every crossing and the strength given to the network of steel by this means must be tested to be appreciated. Two heavy men can hang their whole weight on one of the ½in. square bars at any point, without producing any serious deflection of the steel.

The great strength of the steel work is a distinct advantage in several ways. The partitions can be anchored to it instead of being carried right up to the concrete, thus leaving the whole of the space between concrete and plaster clear for water pipes, soil pipes, conduit, telephone cables, etc. The weight of these can be carried on the steel bars without the slightest fear of disastrous consequences.

The job was done by four men, two lathers, one welder and one helper. The lather put the steel up in place. The helper passed the steel up from the stock pile and shifted scaffolding as required, and the welder followed them up. The arrangement worked smoothly, and good time was made on the job. The welder occasionally had to work a little overtime to keep up with the lathers, but he averaged approximately 135 welds per hour, or nearly 1,100 per day. This seems fairly good going, especially as he was walking about on planks about five feet from the ground and all the welding was over his head.

The apparatus used was a standard Lincoln 150 ampere variable voltage arc welder which was connected up to a temporary service furnished by the Toronto Hydro-electric system. The machine was installed in a corner of the ground floor and the welding cables were run up from floor to floor as the work progressed.

Owing to the success of this work it seems probable that other jobs of a similar nature will be done in this way and the use of electric welding in building construction extended in the near future. The advantage of this method of ceiling construction can be obtained without adding to the cost of the building at all, perhaps even at a slight saving.

Manager of Hamilton Bridge Works Co's. Toronto Office

Mr. N. Leroi Crosby who, as announced in last week's issue, has been appointed representative in Toronto of the Hamilton Bridge Works Co. Ltd., with offices at 410 General Assurance Building.

Toronto E. I. C. Calendar

March 15—Annual meeting for the reception of reports, election of office bearers, and general business.

Hydro-Electric Progress in Canada in 1922

Outstanding Feature of Last Year Was the Initiation of New Development—Projects Involving 1,000,000 h. p. Are Under Way—240,000 h. p. Installed During the Year—A List of Activities

By J. B. CHALLIES
Superintendent Water Branch, Department of the Interior, Ottawa

From figures compiled by the Dominion Water Power Branch, Department of the Interior, Ottawa, it is shown that during 1922 the total water power installation in Canada grew to approximately 3,000,000 horse power of which 240,000 were installed during the year. This figure does not include 190,000 horse power installed during 1921 but only brought into operation after that year closed.

The most significant feature of 1922 from the hydro-electric standpoint was the initiation of new development. Projects are under way which will have an ultimate capacity of over one million horse power, thus indicating in no uncertain manner that the progress maintained through the war and post-war periods largely by the extension of existing developments will be sustained and probably stimulated by entirely new enterprise.

The details of progress during 1922 are set forth in the following paragraphs, but special attention may be called to the storage developments on Stave Lake and Falls Creek in British Columbia to increase the output of existing plants; the development of the Manitoba Power Company at Great Falls on the Winnipeg river where the first unit of a 168,000 h.p. development was put into service in December; the rapid increase of installation by the Ontario Hydro-Electric Commission at Queenston; the great activity in Quebec, which includes immense developments under way on the Saguenay river and at Gres Falls on the St. Maurice, also the steadily maintained progress in the Maritime provinces. The particulars of the progress during 1922 by provinces is as follows:—

British Columbia

New hydro-electric construction work in British Columbia during 1922 included a development of 7,200 h.p. on the Bull river in the south-eastern corner of the province by the East Kootenay Power Company. This plant serves an important mining area in the Fernie, Cranbrook district. The same Company also commenced construction of a 24,000 h.p. development on the Elk river near Elko. The initial installation which will consist of two 8,000 h.p. turbines is expected to be completed by the fall of 1923.

The British Columbia Electric Railway Company has under construction extensive alterations to its development at Stave Falls at the outlet of Stave Lake involving an expenditure of $1,250,000. The main dam is being raised 20 feet and additional side dams are being erected which will approximately double the water storage. An additional unit of 13,000 h.p. was installed and placed in operation in November, 1922, which brings the total in this plant to 52,000 h.p.; provision is also being made for the addition of a fifth unit.

The Granby Consolidated Mining and Smelting Company in 1922, commenced construction of a large concrete storage dam on Falls creek near Anyox at an estimated cost of $500,000. When complete this dam will provide additional storage of 25,000 acre feet which is intended to eliminate the necessity for steam generated power for the Company's plant and smelter. The Company contemplates the installation of a new 3,600 kw. unit during 1923.

The Pacific Mills Limited at Ocean Falls also commenced in 1922 the work of raising their existing dam an additional 15 feet to provide additional storage of water.

Towards the close of the year activity was being evinced in a project to develop power on the Adams river for the supply of Kamloops and adjacent territory. Rate-payers of Kamloops have since passed a by-law authorizing a contract being made for a block of power from this development if it is proceeded with.

Manitoba

At Great Falls on the Winnipeg river in Manitoba the first milestone in the completion of the 168,000 h.p. development of the Manitoba Power Company was passed on December 28th, 1922, when the first unit of 28,000 h.p. was placed in operation under

Table 1.—Developed and Available Power in Canada

Province	Turbine Installation in H.P. On Jan. 1, 1923	Installed during 1922	Available 24 hr. power at 80% efficiency At Ordinary Minimum Flow H.P.	Dependable for six months H.P.
British Columbia	328,977	20,200	1,931,142	5,103,460
Alberta	33,067		475,281	1,137,505
Saskatchewan			513,481	1,087,756
Manitoba	134,025	34,900	3,270,491	5,769,444
Ontario	1,299,230	130,300	4,950,300	6,808,190
Quebec	1,073,883	43,550	6,915,244	11,640,052
New Brunswick	42,039	11,100	50,406	129,807
Nova Scotia	47,100	234	20,751	128,264
Prince Edward Island	2,239		3,000	5,270
Yukon & N.W. Territories	13,199		125,220	275,250
Canada	2,973,759	240,284	18,255,316	32,075,998

partial head. This event was the culmination of a year of remarkable constructional achievement in which the program, as planned by the Company, was carried out in every respect. The initial installation in this plant will consist of two units totalling 56,000 h.p. and provision has been made for four additional units of 28,000 h.p. each giving an ultimate capacity of 168,000 h.p.

The municipal plant of the City of Winnipeg at Point du Bois on the Winnipeg river was increased in capacity during 1922 by the addition of a unit of 6,900 h.p. This brings the installation in this plant to eleven units aggregating 67,100 h.p. Provision still remains for the addition of five more units which will be added as the growth of the load demands.

In preparation for still further demands for power the city commenced studies of a development at Slave Falls, five miles below Point du Bois on the Winnipeg river. It is also of interest to record that the city has decided to construct a steam standy-by plant in Winnipeg of 15,000 h.p. capacity to be operated in the event of temporary breakdowns in the hydro-electric supply.

Ontario

As in recent years the construction operations of the Ontario Hydro-Electric Power Commission during 1922 ranked first in magnitude. Work continued throughout the year on the 550,000 h.p. Queenston-Chippawa development and the initial stage of this project now nears completion. Of the five 55,000 h.p. units included in this initial installation the first was placed in operation in December, 1921, the second, third and fourth in 1922 and the fifth is expected to be ready in the present year. Due to the rapid increase in the load on the Niagara System, plans are being advanced for the completion of the Queenston station to the full 550,000 h.p.

At Ranney Falls on the Trent river near Campbellford, Ontario, the new 10,000 h.p. development of the Commission was completed and placed in operation during August last. Additional powers on the Trent river at Dams 8 and 9 are now being investigated by the Commission also powers at Bingham Chute on the South river and at Port Severn on the Severn river.

The Canadian General Electric Company completed the reconstruction of their development at Nassau on the Otonabee river by the addition of a 1,300 h.p. unit. The power is used in the Company's works at Peterborough.

In Northern Ontario two new developments to serve the gold and silver mining areas were placed under construction and the work well advanced before the end of the year. At Sturgeon Falls on the Mattagami river the Lower Sturgeon Power Co. Ltd. are installing 8,000 h.p. to serve the mines at Porcupine and expect to have the power available in February or March of the present year. At Indian Chute on the Montreal river the Great Northern Power Co. Ltd. are constructing a development with a designed capacity of 6,450 h.p. It is expected to place the first unit of 2,150 h.p. in operation during March this year. The output from this plant will serve mines in adjacent territory.

At Kapuskasing on the Kapuskasing river the Spruce Falls Company have under construction a development with an initial installation of 2,500 h.p. to supply power to their pulp mill at that place. This work was well advanced at the end of 1922.

On the little Thessalon river the town of Thessalon constructed a development of 200 h.p. which went into operation in December last and is serving the town with light and power.

In North Western Ontario at Kenora the Backus-Brooks Company completed the installation of 4,800 h.p. in the power development at the outlet of the Lake of the Woods formerly owned by the town of Kenora. Present plans contemplate the addition of new units during the present year which will bring the total installation to 10,800 h.p.

In the same district also the Dryden Paper Company commenced construction on a new plant at Wainwright Falls on the Wabigoon river four miles north west of Dryden. A single unit of 1,400 h.p. is being installed and is expected to be in place in February of the present year.

The total turbine capacity installed in Ontario during 1922 amounted to 130,300 h.p. with provision well advanced for extensive additions in 1923.

It is of interest to record that during the year a report was presented to the Temiskaming and Northern Ontario Railway Commission by engineers engaged for the purpose, which recommended the electrification of the railway and advised that powers on the Amable du Fond, Blanche and Frederickhouse rivers be reserved for the same.

Quebec

In the Province of Quebec the turbine capacity actually installed during 1922 did not reach the figure of the previous year but a number of very important projects were commenced which will add very materially to the utilization of the large power resources of the province.

At Shawinigan Falls on the St. Maurice river a unit of 43,000 h.p. was installed and placed in operation during October in number two power house of the Shawinigan Water & Power Company. Provision has also been made for the addition of two more such units. At the Grand Mere plant of the Laurentide Power Company the two 22,000 h.p. units which had been installed in 1921 were placed in operation and similarly at the Cedars plant on the St. Lawrence river of the Montreal Light, Heat & Power Consolidated the two 11,300 h.p. units installed in 1921 went into operation. For the latter plant four additional units have been ordered, some of which are expected to be in operation in the autumn of 1923.

Among other hydro-electric developments placed in operation during 1922 may be mentioned a 150 h.p. plant at St. Prime in the lake St. John district; a 350 h.p. plant at Papineauville on the Little Nation river replacing a previous plant destroyed by fire and a new plant of 400 h.p. on the Blanche river in Labelle county placed in operation during November by Cie, Electrique de Rockland Ltee. to supply Rockland, Ontario and other municipalities. In this connection may also be mentioned the completion of a new concrete dam by the Pembroke Electric Company at their 4,000 h.p. plant on the Black river at Waltham, P. Q. to increase its capacity and maintain a higher head.

Construction was commenced during 1922 on a number of important projects throughout the Province. At Gres Falls a short distance below Shawinigan Falls, work was started during October on a new 125,000 h.p. development for the St. Maurice Power Company. This installation will comprise four units operating under a head of 65 feet and it is expected to have it in operation in 1925.

The Lower St. Lawrence Power Company commenced a 3,700 h.p. development near the mouth of the Metis river and work was well advanced by the end of the year. It is expected to have the plant in operation by July, 1923, and power will be supplied in the district extending from Matane to Rimouski.

Owing to increasing demands for power in the Eastern Townships area the Southern Canada Power Company expect to start construction on a new development at Hemming Falls on the St. Francis river above Drummondville. This plant will have a capacity of 30,000 h.p. operating under a head of 50 feet.

In the Ottawa-Hull district two new developments are contemplated. The Ottawa and Hull Power and Manufacturing Company has had plans prepared for a development one mile below Bryson, P. Q., on the Calumet channel of the Ottawa river. The initial installation will comprise two units of 14,500 h.p. each with provision made for the addition of two larger units. The power will be transmitted to Ottawa and will also supply towns and villages on the way. The Hull Electric Company has completed surveys for a development at Paugan Falls on the Gatineau river which will have an ultimate capacity of 100,000 h.p. under conditions of regulated river flow.

The largest project for which final definite arrangements have recently been made with the Quebec Government is that of the Quebec Development Company on the Saguenay river at the outlet of Lake St. John. The present development is to have a capacity of 350,000 h.p. of which 200,000 h.p. is to be ready in five years. Lake St. John, whose storage possibilities have been thoroughly investigated by the Quebec Streams Commission, is to be used as a storage reservoir in connection with the project, a total storage depth of ten feet on the lake being feasible.

The Quebec Streams Commission, whose work has proved of the greatest assistance to the proper development and use of the water powers of the province, has recently asked for tenders in connection with the Kenogami lake storage project to regulate the Chicoutimi and Sable rivers on which much power is utilized in the pulp and paper industry. The construction of this reservoir involves an expenditure of $2,500,000.

The Savanne reservoir with a capacity of 30,000,000 cubic feet on the St. Anne de Beaupre river was completed by the Quebec Streams Commission in the latter part of 1922 at a cost of some $200,000 for the further regulation of the river flow at the St. Fereol power development.

Among other projects now in the hands of this Commission are those of storage reservoirs for flow regulation on the Oureau, Gatineau and Metis rivers.

Summarizing the construction in the province for 1922, some 43,550 h.p. of new installation were added, 66,600 h.p. installed during 1921 were placed in operation and a number of very important projects were placed under way.

New Brunswick

In New Brunswick the province carries on an active development policy through the New Brunswick Electric Power Commission. The first development undertaken by the Commission on the Musquash river near St. John was completed and ready for operation by July, 1922, with an installation of 11,100 h.p. Owing, however, to differences between the City of St. John and the New Brunswick Power Company the agency of its final distribution was not settled until December, 1922, when the City of St. John

List of Hydro-electric Activities in 1922

Plan No.	COMPANY OR OWNER	PLANT	Installation made 1921 and placed in Operation 1922	New Installations or additions 1922 H.P.	Total Present Installation	Installations under construction or actively projected
1	British Columbia Electric Railway Co.	Stave River		13,000	52,000	
2	East Kootenay Power Co., Limited	Bull River		7,200	7,200	
3	East Kootenay Power Co., Limited	Elk River near Elko				16,000
4	Manitoba Power Co.	Great Falls, Winnipeg River		28,000	28,000	28,000
5	City of Winnipeg	Point du Bois, Winnipeg River	6,900	6,900	67,100	
6	Backus-Brooks Co.	Kenora		4,800	8,200	2,600
7	Dryden Paper Co.	Wabigoon River				1,400
8	Town of Thessalon	Little Thessalon River		200	200	
9	Spruce Falls Co.	Kapuskasing				2,500
10	Lower Surgeon Power Co.	Sturgeon Falls, Mattagami River		4,000	4,000	4,000
11	Great Northern Power Co.	Indian Chute, Montreal River				6,450
12	Hydro-Electric Power Commission of Ontario	Queenston-Chippewa, Niagara River	110,000	110,000	220,000	220,000
13	Canadian General Electric Co.	Nassau, Otonabee River		1,300	2,700	
14	Hydro-Electric Power Commission of Ontario	Ranney Falls, Trent River		10,000	10,000	
15	Ottawa & Hull Power & Manufacturing Co.	Calumet Falls, Ottawa River				30,000
16	Hull Electric Co.	Paugan Falls, Gatineau River				100,000
17	Cie. Electrique de Rockland	[illegible] River		400	400	
18	Montreal Light, Heat & Power Consolidated	Cedars Rapids, St. Lawrence River	22,600		152,200	45,200
19	Laurentide Power Co.	Grand Mere, St. Maurice River	44,000		164,000	
20	Shawinigan Water & Power Co.	Shawinigan Falls, St. Maurice River		43,000	191,500	
21	St. Maurice Power Co.	Le Gres Falls, St. Maurice River				125,000
22	Southern Canada Power Co.	Hemming Falls, St. Francis River				30,000
23	Cie. Electrique St. Prime	St. Prime		150	150	
24	Quebec Development Co.	Saguenay River				350,000
25	Lower St. Lawrence Power Co.	Metis River				3,700
26	Maine & New Brunswick Power Co.	Aroostook Falls			5,000	2,500
27	New Brunswick Electric Power Commission	Musquash River		11,100	11,100	
28	Cambridge & Waterville Hydro-Elec. Power Co.	Tupper Lake		84	84	
29	Gaspereau River Light, Heat & Power Co.	Whiterock, Gaspereau River		150	1,105	
30	Nova Scotia Power Commission	St. Margaret Bay	10,820		10,820	
31	Nova Scotia Power Commission	Malay Falls, East River Sheet Harbour				3,700
		TOTALS	194,320	240,284		971,050

NOTE—In addition to the installations in the above table provision has been made in a number of existing plants for extensive additions as the loads increase. In addition also to the projected plants listed there are numerous other projects under study.

contracted with the New Brunswick Electric Power Commission to purchase energy up to 15,000,000 kw. hrs. per annum at a price of 1.2 cents per kw. hr. The City and the New Brunswick Power Company have not yet composed their differences with regard to the distribution of the power; the civic authorities in the meantime are making preparation to build their own distribution system. The City of Moncton had already contracted with the Commission for 5,000,000 kw. hrs. per annum and the transmission line to that city was nearing completion at the close of 1922.

At Aroostook falls on the Aroostook river the Maine and New Brunswick Power Company commenced work on extensive alterations to their plant. Two new units of 2,000 h.p. each are to be installed and will replace two old units rated at 750 h.p. each. With the new units in place this plant will have a capacity of 8,400 h.p. It is expected to have the alteration completed by August, 1923.

Investigatory studies were made by the New Brunswick Electric Power Commission of proposed developments on the Nepisiguit and Tetagouche rivers. It has also been lately reported that the Commission have under consideration the development of Grand Falls on the St. John river.

Nova Scotia

The Nova Scotia Power Commission formed in 1919 for the purpose of creating a complete electric power system for the province brought into operation in June, 1922, its 11,000 h.p. development at St. Margaret's Bay. This plant has since been carrying the entire load of the City of Halifax and under the present peak conditions the city load is rapidly approaching its maximum capacity. Additional installation of 5,000 h.p. may be added to this development before its ultimate capacity is reached.

Among other hydro-electric installations made in Nova Scotia during 1922 may be mentioned a development of 84 h.p. on Tupper lake stream by the Cambridge & Waterville Hydro-Electric Power Company to serve the towns of Cambridge and Waterville also the addition of a unit of 150 h.p. to the plant of the Gaspereau River Light, Heat and Power Company Limited on the Gaspereau river.

Preliminary construction was started in September by the Nova Scotia Power Commission on a new development at Malay falls on East River Sheet Harbor. This development will have an initial installation of two 1,850 h.p. units with provision made for a third unit of the same capacity. Power will be transmitted to the towns of Pictou, Stellarton, New Glasgow, Trenton and Westville. Tenders are being called for turbines and generators and it is expected to have the plant in operation early in 1924.

Plans for a development on the east branch of Bear river for the supply of the north shore of the province from Yarmouth to Middleton have been prepared by the Commission.

The Avon River Power Company has surveys under way for a small development on the Avon River to serve Windsor, Nova Scotia.

Cost of County Road Construction

In Norfolk County, Ont., 8¾ Miles of 18 ft. Tar Macadam Penetration Road Cost $199,647—8 Miles of Gravel Road, 14 ft. Wide, Cost $69,860—What These Figures Mean to the Taxpayers

By G. R. MARSTON
County Engineer, Norfolk County, Ontario
Before the Ontario Goood Roads Association

It has been truly said that "Not to build Good Roads is a blight upon a nation, and not to maintain them is a criminal waste of public property," therefore the people of the Province of Ontario should be grateful that the organization known as "The Ontario Good Roads Association" was formed in 1894, for this was the first step towards the construction of good roads in this Province and this association was very instrumental in the passing of "The Highway Improvement Act" of 1901 which meant the introduction of county road systems and practically the first attempt at organizing the construction of county roads. The interest in the county road movement increased by leaps and bounds as is shown by the fact that in the year 1902 only one county had taken advantage of "The Highway Improvement Act," this being the county of Wentworth, whereas in 1910 the number had increased to 20, and in 1917, thirty-seven counties had taken advantage of this Act and had taken over systems of county roads to be operated under the jurisdiction of county councils, until at the present time most county councils are faced with the fact that their county road systems are absorbing more funds than any other department in county expenditures. This is not to be wondered at when one considers the increased commercial traffic of the province, and the increased passenger traffic by automobiles.

People are inclined to criticise the expenditures which are being made for road purposes, but if they will take notice of the expenditures for travel it might be different. The increase in automobiles between January, 1918, and December, 1922, in the Province of Ontario is 131,533 passenger cars and 19,235 commercial cars, or expressed in dollars an expenditure of about $100,000,000. Taking the total number of cars in Ontario, including passenger and commercial cars, we have a grand total of 234,172, and taking 2,000 miles as an average mileage per car per year, we find that the cars of Ontario travelled 468,344,000 miles in 1922. A conservative estimate of cost for travel including gasoline, oil, tires and repairs has been placed at 10 cents per mile, and we deduce from that that in 1922 the owners of cars paid $46,834,400.00, a sum equal to twice the expenditure made in construction and maintenance of roads in the Province of Ontario during the same year.

There are at least four essential points to be considered in the construction of county road systems.

1. The adoption of a system of County Roads under

the Highway Improvement Act.

2. A definite plan laying out the order of constructing the roads of the said System.
3. Types of road to be constructed.
4. Financing.

The County of Norfolk assumed a system of county roads under the Highway Improvement Act in the year 1917, attaching a rider to the By-Law that no road construction work be commenced during the war period. In 1919 a definite plan for the order in which the roads should be built was adopted. In the policy adopted by the county council the types of construction decided upon were tar macadam penetration for the provincial county roads and other main travelled highways, and gravel construction for those of lesser importance, the provincial county roads to be graded 28 feet wide with 18 feet of metal and the county roads to be graded 24 feet wide with metalling not less than 14 feet in width. To date there has been constructed 8¾ miles of tar macadam penetration, 18 feet wide; 3 miles of tar macadam, 14 feet wide; 4 miles of macadam base, 14 feet wide and 8 miles of gravel road construction, 14 feet wide.

In the construction of the tar macadam roads it was desired to get a 10 inch depth of completed road, but in many instances the thickness is greater owing to the sub-soil being unstaple; consequently a greater amount of stone was used in the foundation.

The following figures relate to the construction of a provincial county road, width of metal being 18 feet:—

Total length of road	8¾ miles
Total square yards of metal portion	92,400

The cost is divided as follows:—

Grading	$ 5,500.42
Tile draining	625.35
Culverts	1,628.28
Material (Stone 44,096 tons.) (Tar 192,000 gallons.)	136,784.13
Hauling	29,587.51
Levelling	5,379.96
Rolling	7,856.30
Heating Tarvia	1,843.83
Unloading Stone	10,372.39
Guard Rails	69.00
Total Cost	$199,647.17
Cost per mile	$ 22,816.82
Cost per square yard	$ 2.16

It must be remembered, however, that while the cost of this 8¾ miles is $199,647.17 only 40% is chargeable to the county. This may be more clearly shown in the following schedule:—

Total cost	$199,647.17
Amount paid by Province	119,788.30
Actual cost to County	79,858.87
Cost per mile	22,816.82
Amount paid by Province	13,690,09
Actual cost to County	9,126.73
Total cost per square yard	2.16
Amount paid by Province	1.276
Actual cost to County per square yard	.864

While the above analysis gives the actual data as far as the province and county are concerned it does not convey any idea what this cost may mean to an individual rate payer. Taking the actual cost per mile to the county at $9,126.73 and bearing in mind that the equalized assessment is $14,230,000.00 the cost per mile per $1,000.00 assessment is 64 7-10 cents. In other words a rate payer having an assessment of $1,000.00 has been called upon to contribute $5.66 towards the construction of this 8¾ miles.

In the construction of the gravel road the same precautions were taken in grading and drainage as in the construction of the Tar Macadam road. It was aimed to get a consolidated roadbed of 12 inches of gravel, excepting in places where bad sub-soil was encountered and then extra gravel was used. A crushing outfit with bin was purchased and all gravel was crushed; the gravel was laid in two courses and rolled until compacted. The total cost of the 8 miles is $69,860.59 which is divided as follows:—

Grading	$10,459.58
Culverts	8,194.53
Tilt draining	2,915.64
Material (Gravel 29,575 yds.)	1,734.85
Hauling	23,855.68
Levelling	2,369.71
Rolling	3,621.26
Crushing	15,516.77
Shovelling	1,192.57
Total Cost	$69,860.59
Cost per mile	$ 8,732.57
Cost per square yard	$ 1.06

Of this cost the province pays 40% and without going into detail this road has cost the rate paye 36 8/10 cents per mile per $1,000.00 assessment.

A. St. Laurent Passes Away

Mr. Arthur St. Laurent, chief engineer of the Department of Public Works, Ottawa, and president of the Engineering Institue of Canada, died at his home in that city on March 6, after a two month's illness. Deceased was born at Rimouski, P. Q., in 1859 and was an 1885 graduate of the Ecole Polytechnique, Montreal. Prior to his entering the Department of Public Works, Mr. St. Laurent was engaged for three years on the location of the Temiscouata Railway. In 1888 he entered the government service, as assistant engineer at the district office, Winnipeg, where he remained for ten years. Following this, he was in charge of the construction of a large concrete bridge over the Saskatchewan River at Edmonton, the first concrete bridge built in the West. Another big project which was designed by Mr. St. Laurent was the lock and dam at St. Andrew's. In 1908 he was appointed assistant deputy minister of public works and in that capacity had been connected with several large engineering undertakings for the government, including extensive navigation schemes, harbors and drydocks. A little over a year ago he became chief engineer of the department. Mr. St. Laurent was vice-president of the Dominion Water Power Board and previous to his recent election as president of the Engineering Institute of Canada, was vice-president of that organization for three years. He was also a member of the American Society of Civil Engineers.

Construction Developments During the Month of February

Figures Compiled by MacLean Building Reports, Ltd., Show Trend of Building Activities for Last Month—Details of Contracts Awarded in Eastern and Western Canada

Construction Contracts Awarded in Eastern Canada, February, 1923

	Ontario		Quebec		New Brunswick		Nova Scotia		Eastern Total	
	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value
Apartments	1	$ 50,000	2	$ 20,000	....	$............	....	$............	4	$ 75,000
Churches	2	114,000	3	230,000	....	....	....	....	5	344,000
Factories	10	2,617,000	3	102,000	....	....	....	....	13	2,719,000
Garages	....	....	1	8,000	....	....	....	....	1	8,000
Hotels and Clubs	2	53,500	1	8,000	....	....	....	....	3	61,500
Office Buildings	7	149,500	2	45,000	....	....	....	....	9	194,500
Public Buildings	3	85,000	1	2,215,500	1	100,000	1	3,000	6	2,403,500
Residences	443	2,132,000	45	339,300	....	....	....	....	488	2,471,300
Schools	6	223,500	1	3,000	....	....	....	....	7	226,500
Stores	23	203,800	5	51,000	....	....	....	....	28	254,800
Warehouses	6	1,650,000	2	9,000	....	....	....	....	8	1,659,000
Total Buildings	503	$7,278,300	66	$3,030,800	1	$100,000	1	$ 3,000	572	$10,417,100
Bridges	1	30,000	2	12,000	3	34,000	....	....	6	76,000
Dams and Wharves	....	....	2	67,000	....	....	6	111,600	8	178,600
Sewers & Watermains	6	144,800	....	....	....	....	....	....	6	144,800
Roads and Streets	4	370,500	2	65,000	....	....	....	....	6	435,500
General Engineering	1	10,700	....	....	....	....	....	....	1	10,700
Grand Total	515	$7,834,200	72	$3,174,800	4	$134,000	7	$114,600	599	$11,262,700

Construction Contracts Awarded in Western Canada, February, 1923

	British Columbia		Alberta		Saskatchewan		Manitoba		Western Total	
	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value
Apartments	1	$ 9,500	....	$............	....	$............	....	$............	1	$ 9,500
Churches	....	....	....	....	1	4,500	....	....	1	4,500
Factories	4	276,500	....	....	....	....	1	2,000	5	278,500
Public Garages	3	13,300	....	....	1	5,000	1	3,000	5	21,300
Hotels and Clubs	1	5,000	....	....	1	75,000	1	4,000	3	84,000
Office Buildings	2	149,800	....	....	....	....	1	1,500	3	151,300
Public Buildings	3	29,000	1	11,700	....	....	....	....	4	40,700
Residences	62	247,200	2	4,400	6	21,000	4	25,600	74	298,200
Schools	2	654,000	....	....	....	....	....	....	2	654,000
Stores	13	200,200	....	....	....	....	3	18,500	16	218,700
Warehouses	4	33,000	....	....	1	1,500	1	3,000	6	37,500
Total Buildings	95	$1,617,500	3	$16,100	10	$107,000	12	$57,600	120	$1,798,200
Bridges	5	119,100	....	....	....	....	1	2,100	6	121,200
Dams and Wharves	2	38,600	....	....	....	....	....	....	2	38,600
Sewers & Watermains	....	....	....	....	....	....	1	16,100	1	16,100
General Engineering	1	60,000	1	15,000	....	....	....	....	2	75,000
Grand Total	103	$1,835,200	4	$31,100	10	$107,000	14	$75,800	131	$2,049,100

Getting Service From Road Foremen

The Qualifications for and Duties of Patrolmen Are Outlined in a Book of Instructions Issued by the County of Bruce, Ont.—A High Standard of Ability is Demanded

As indicated in an article in the Contract Record of last week, the County of Bruce, Ont., has adopted the patrol system of road maintenance. In large measure the success of such a method depends on the ability of the patrolmen and their aptitude for road work. In Bruce county, every effort is made to secure and train the right kind of men and with this end in view very complete regulations have been compiled. Because of their importance and interest they are reprinted in this article.

The art of road building and maintenance is not as simple as some would think and few have the special qualifications of a good patrolman or road foreman. These must be acquired by study and practical experience. A patrolman should be industrious, honest, sober and of practical ability so that he will give full value in service for every dollar received. When the road requires dragging, patching, etc., he must give it the necessary attention **at that time and not at his convenience.** If he is unable to do this, it is a duty to the county and himself to secure the services of some one else for the job rather than neglect the road and be discharged for negligence.

While a foreman should use tact and try to keep the job running as smoothly as possible, he must see that his men do a good honest day's work and if they do not do so he should dismiss them immediately even if the job is held up temporarily. Otherwise they will lose all respect for the foreman and conditions will go from bad to worse. When work is supposed to start at 7 a.m. or 1 p.m. the men should be on the job at that hour and not leave home at that time. Men disobeying this rule should be discharged or have their time reduced. The only exception to this rule is hauling gravel from a pit or crusher when the foreman should arrange the work so that every man will put in a full day on the job.

Definition of Good Gravel

Ideal gravel which is uniform and clean, containing one inch stone graded down to coarse sand is very hard to obtain so that we have to take the best available. Frequently we have the option of hauling from several pits and in deciding which one to haul from we have to keep the above in mind. We might even find it advisable to avoid the nearest pit and go half a mile or more farther in order to obtain gravel of a better quality. Workmen frequently shovel on sand and loam as it is easily shovelled but where pockets of the above occur they should be shovelled out. Many think that clay is necessary for packing the road but our experience has been that a slow packing gravel wears the best, and in fact to avoid clay the gravel in some places is washed. If it is necessary to have clay for packing, it can be obtained much more cheaply on the roadside than by hauling it from the pit. The patrolman should always be on the lookout for new gravel land and if he learns of any probable deposits he should bring this to the attention of the road superintendent. By proper procedure we can obtain gravel for road purposes from any pit.

Gravelling Methods

The handling and hauling of gravel costs a great deal of money and in this work a foreman can easily make or lose for the county several times his wages. All surface clay or loam should be removed with scrapers to a lower point so that it will not have to be moved again. By first cleaning the surface of the area required during the job there is no danger of hauling clay on the road or spoiling the gravel on the bottom of the pit if it is not all removed.

If a crusher is not put in, all coarse gravel should be screened as it is a foolish expenditure to haul stones on the road and rake them off again. A suitable screen can be made by placing ⅜" or ½" rods crossways, 1" to 1⅛" apart, on a rectangular frame 8' by 3½' in size. This is put on the edge of the box at an angle so that the larger stone will run off through and the smaller stones and gravel go through into the box. This screen can easily be made by any blacksmith and is a very useful piece of equipment for any patrolman when the gravel has considerable coarse stone in it.

Day's Work in Hauling

Everyone has more or less different ideas on what is considered a good day's work in hauling gravel. Twenty-one miles per day round trip on a fair haul from a gravel pit is considered by most people to be a fair day's work. When hauling from bins on a fair road and a long haul, this may be increased to twenty-five miles per ten hour day, and on very short hauls, when the gravel is shovelled on, or on patch work, it may be reduced.

Size of Loads

There has been quite a variation in the size of load hauled throughout the county. Except under very exceptional circumstances, 1-½ yards per load is considered a fair load. In future we are insisting that every waggon going on county work shall have a 1-½ yard box. Every foreman should see that this load is hauled except when special permission is given by the superintendent. Where the pit is difficult to get out of, it will pay to have an extra horse, if necessary, to help the teams out unless the haul is very short. This horse can be handled by one of the shovellers when required. When a workman wants to put on a team below the average which cannot haul a yard and a half, he should put on three horses, which is commonly done throughout the province. Even where it is impossible for a good team to haul 1-½ yards on particular parts of a road it is wise to have a 1-½ yard box because when you get an opportunity to do so, the boxes do not need to be changed. Only by following the above suggestions can we get uniform work for the dollar throughout the county.

Spreading of Gravel

Great care should be taken in spreading gravel in order to avoid waviness in the road. Maintenance gravel should be spread out ten to sixteen feet wide, in other words, to the full width of the road so that the gravel will not be so thick as to interfere with the traffic. This should be frequently dragged with a drag or preferably a small grader, alternately to the centre and shoulder of the road until the gravel is fairly well compacted. By frequently dragging the gravel towards the shoulder of the road we are always assured of having some loose material to fill up small ruts and depressions. A great many men make a mistake of putting on gravel too heavy. In future, except when given special permission by the superintendent, **not more than half a yard is to be put on in one waggon length and it must be spread out so that fresh gravel will not be more than 2½" thick.** If the road requires more than that in a year it would be better to give it two or three light coats during the season. Where the roads are wide and heavily travelled the gravel should be placed on the sides only and drawn in as required. This will leave the road in good shape for traffic during the summer months. Large stones should not be hauled on the road but if any are there they should be raked off. Gravel should not be drawn during the wet weather, if possible, as hauling gravel over wet roads often does more harm than good.

Grading Methods

Probably there is no job in road building where a foreman can show his ability to more advantage than in grading. Care should be taken that the ditches are straight for stretches of a mile or more, if practicable, and that the road is as near to the centre of the right of way as possible. Where slight bends have to be made, they should be made at the top of a hill so they will not be noticeable. A great many telephone poles are too near the centre of the road; they should be at least twenty-five feet from the centre of the right of way. When telephone companies are putting up new poles, the patrolman should see that this rule is followed or bring the matter to the attention of the road superintendent.

Preparation for Large Grader

In preparing the road for the grading outfit, large stones, brush, stumps, etc., should be removed and a straight furrow should be run where the centre of the ditch will come, as a guide for the grader. In the case of county roads, these furrows should be 30 to 32 feet apart and on provincial county roads 34 to 36 feet apart. This will allow for a ditch two feet deep and a 24 to 26 foot roadway in the case of county roads and a 28 to 30 foot roadway in the case of provincial county roads. The top of the road should be left as nearly level as possible. When the shoulders settle a little the road will have sufficient camber. Many make the mistake of having the road too high in the centre. This has the following disadvantages: Traffic has to keep to the centre, forming ruts which soon ruin a road; it is inconvenient to turn out and often dangerous; and when dragging, the gravel is very apt to run into the ditches.

Finishing Grading

The large grader should be followed by a one-team-grader and scrapers to widen out narrow places left by the grader, to widen out cuts on hills and remove any surplus earth on the shoulder of the road. This work can be done more cheaply when the grading outfit is on the job than later. Under no circumstances should the old road bed be covered with clay or be disturbed in any way except when instructed to do so by the road superintendent.

Economical Haul With Scrapers

The economical distance to which earth can be moved by slush or wheel scrapers depends, of course, on the job and has to be decided on by the foreman. Generally speaking, for distances over 200 feet for slush scrapers and 400 feet for wheel scrapers, it is cheaper to load by hand into waggons. If the material cannot be loaded into waggons very quickly it is more economical for a teamster to have two waggons and while one is being loaded, haul the other. This will keep the team going almost continuously.

Methods of Ditching

In constructing ditches with slush scrapers, many make the mistake of filling the scraper slowly by taking off a shallow layer of earth, dumping on the shoulder and returning to the point they started at. The most economical way is to plough 200 yards or more, start at one end with the scraper, fill and dump on the shoulder of the ditch, swing into the ditch again and continue in the direction started and so on until you go the full length of the ditch. However, if the ditch can be ploughed very deep and the scraper can be filled in three or four feet, it is probably better to return to the place started and clean out the ditch as you go along.

Tile Culverts

Care should be taken in putting in tile culverts to have them laid straight and with a slight fall so that the water will not lie in the bottom. When putting in tile, if a shovel full of earth is removed under each joint it will be possible and much easier to get the tile to fit tightly against each other. These tile should be put down such a depth that there will be no danger of trucks breaking them and a suitable outlet should be provided. Many make the mistake of putting a large pile of earth over the tile which makes the road bad for traffic and dangerous. If the clay covering the tile is packed as solidly as practicable it will settle very little and there is no need of all the earth being put on that we so often see. When the road is graded wider, the tile should be lengthened out or stakes put up at each end to warn the public until the lengthening has been done.

Farm Entrances

At farm entrances which a farmer uses so often that he has a gate, we supply him with tile if he does not have any and the ditch is opened up in front of his property. He hauls the tile and puts them in. The patrolman should see that these tile are put down in line with the ditch and at least two feet deep as the ditches will eventually be at least that depth. At farm entrances we allow 20 feet for a main entrance and at field entrances 12 feet, not more than one main entrance and one field entrance on one original lot allowed except by special permission from the superintendent.

Size of Tile

The size of tile to use depends on the watershed, or, in other words, the area of land drained through the culverts. The sizes recommended are as follows: 5 acres, 12 to 15"; 10 to 15 acres, 18"; 20 to 25 acres, 24" and 30 to 35 acres, 30". For larger watersheds it would be better to build a concrete culvert. These sizes may seem larger than necessary but they will carry the surface water satisfactorily in the worst floods.

Duties of Patrolman Without Instructions from Road Superintendent

While extensive construction work, operation of crushers, large graders and concrete culvert gangs is handled by foremen working continuously, a patrolman has certain work as indicated below, which, in order to be a success, he must do without being particularly instructed to do so by the road superintendent. It can be summed up in a few words, namely: Attend to all small repairs and light maintenance so that the road will always be safe and in as good shape as reasonably possible for traffic.

Dragging

The main duty of a patrolman is to keep the road surface smooth and free from ruts so that the water will not stand on the road and can get away freely to the ditches. If water is allowed to stand on the road it soon becomes impassable. To accomplish this he should drag the road every week or two after a rain, depending on the condition of the road and amount of traffic. In the spring and fall it should be dragged very frequently and if this can be done just before it freezes up it will stand the winter better. Every three or four weeks he should go over his whole beat with a waggon and shovel off sufficient to fill up holes and depressions with gravel if this cannot be done with a drag. On hard roads with heavy traffic in which the gravel will not pack easily it should be tamped thoroughly and, if necessary, dampened so that cars will not immediately throw it out.

Ditches

Ditches and drains are to be kept clean and free from obstructions and they should be improved where practicable so that water will not remain on the road or roadside. On the side of roads on the face of hills the ditches should be kept clean to keep the water from running down the centre of the road. To accomplish this the camber of the road should be greater than is usual on the level.

Snow and ice are to be removed from the ends of culverts and drainage outlets are at all times to be carefully watched so that they are not obstructed by leaves, weeds, silt or other material.

Brush and Weeds

Brush should be cut at all cross-roads, bridges, railway crossings, curves or other points of danger. About the end of June the patrolman should go over the whole road with a mower and cut the grass and weeds between the ditches. Where weeds are particularly bad, they may be cut to the fences if necessary.

Stones on Road

Large loose stones are to be raked from the surface of the road and hauled away.

Bridges and Culverts

Floors of bridges and culverts, approaches to bridges and culverts are to be kept in repair. When the road is widened and a culvert is narrower than the road, stakes should be put up at each end to warn the public and if the culvert will last for some time a railing should be put up.

Lights

The patrolman should promptly provide protection in case of washouts or other emergency and place red lights, notifying the superintendent of any such conditions.

Snow Roads

Snow roads should be kept in passable condition and when help is needed to do the work promptly, he should engage the necessary assistance.

In ploughing the road, when the track is built up too high, the common practice is to fasten a walking plough behind the front bob of a sleigh so that shear will just be inside the runner and plough a furrow in each track throwing the snow out. The sleigh keeps the plough in place and the operator sits on the rear bob. To shove the snow out far enough it is a good plan to fasten a board about four feet long to the mouldboard and just behind it which acts as an extension. After this it is usually a good plan to go over the road with a heavy farm roller to level out the road so it will not drift in again.

Injuries to Workmen

If any workmen is injured, full particulars should be sent in writing as soon as possible to the road superintendent.

Responsibility for Tools

The patrolman will be held responsible for tools provided by the county which are to be kept suitably protected and in proper repair.

Mail Boxes

The patrolman should see that mail boxes do not project nearer the centre of the road than the inside slope of the ditch.

Extensive Work

Extensive gravelling of over one-quarter of a mile, grading and ditching, except as indicated above, should not be done without the order of the road superintendent.

Fence Bonus

If a rail or board fence on the road gathers snow badly or otherwise is a nuisance the patrolman should bring this to the attention of the road superintendent. On being requested in writing by the road superintendent to remove the fence the county will pay a bonus of 25 cents per rod for replacing with wire.

Making Out Accounts

Making out accounts will have to receive more attention from many of the patrolmen. While most men can send in accounts for money, they occasionally do not put their report in such form that we can see exactly whether they are giving value or not. If any of the foremen had to pay bills out of their own pockets they would want to know what was done for the money and so should the county. We issue a report which must be filled out. From this information we can find out the cost per yard for handling gravel and cost per yard mile for hauling, etc. The cost per yard mile is the cost of hauling a yard of gravel one mile or half a yard two miles, and by increasing your load the cost will be greatly reduced.

Reports

If you should do two strips or more of gravelling, for instance, one 500 yards and the distance from the centre of this 500 yard strip to the pit is one mile, and say another 400 yard strip and the average distance is two miles, say so in your report as this is the only accurate way to find your hauling costs.

These reports may not include all work you might be doing but where possible, give costs per unit length; for instance, if ditching, give the cost per rod and for cutting brush and willows, try and do the same.

We have or soon will have located every pit used for county roads and we check over the distances, etc., given. Each report is summarized and is recorded in a separate account for each foreman so that we know at a glance how any man is handling his work.

Vouchers

If the foreman pays for material or repairs he should send a voucher certifying that it has been paid and the money will be paid the foreman. If it has not been paid by the foreman before sending it in, he should check it and certify to its being correct and include it on his pay sheet. When farmers obtain tile for farm entrances from local dealers, the bill should be sent to the patrolman, who will check and O.K. if correct and forward to this office. All accounts should be included in the pay sheets.

Definition of Construction

Work in connection with putting in tile culverts, grading a portion of the road, reduction of grades and ditching which will extend over distances of over one mile should be classed as construction and small repairs, cleaning out ditches, dragging, etc., should be classed as maintenance.

Where a patrolman is working on two different roads or where his beat extends from one township into the other, it will be necessary that he show in detail the amounts spent on each road and in each township. If necessary, make out a separate bill for each.

Frequency of Reports

Bills and accounts should be made up to the end of each month and forwarded to the county engineer's office. If a foreman does $200.00 of work or more in two weeks, these reports must be sent in every two weeks, on the first of the month and the 15th, as we have to keep in close touch with every job when large amounts of money are spent. If $200.00 or more is spent in one week the reports should be sent in weekly. These accounts should be sent within two days after the 15th and 1st of the month so that we can check them over and prepare for payment, otherwise, they may be held over to the pay a month later.

Time Books

Care should be taken to mark the time put in by each man each day, otherwise mistakes might occur. If the time book is not kept up to date and if any man should dispute the statement of the patrolman it is doubtful if the court would accept the patrolman's statement. Pay books will be issued to every patrolman at the beginning of each year and the old ones are to be returned.

Drainage Practice in the County of Oxford

Objections to Open Ditches Along the Roadside—The Procedure Followed in Providing a Road with Drainage Facilities—Importance of Locating Catch Basins Properly

By F. J. URE
County engineer, Oxford County, Ont.
Before the Conference of County and Township Road Engineers and Superintendents

We all admit the necessity of keeping the subsoil, which is the foundation of the road, dry. In some soils of a gravelly or sandy character nature takes care of the drainage, but in most cases nature needs more or less assistance, and it is the province of the engineer or road superintendent to decide the extent and character of the assistance to be given.

I am strongly opposed to the use of deep open ditches adjoining the road-bed for the following reasons:—

1st.—They take up a lot of valuable space, the amount of which increases with time as the banks weather away.

2nd.—They are not pleasing to the eye, especially after the first winter's frost has destroyed the sand-paper effect on the slopes.

3rd.—They require a considerable amount of maintenance, and

4th and most important.—They are a continual and serious menace to the safety of the users of the road.

The Dangers of Open Ditches

The advocates of this system of subsoil drainage will say that they are making the roadway wide enough, so that there is no excuse for anyone getting into a ditch. Quite true, but we all know that accidents do happen, a steering knuckle may give away, a front tire may burst, a collision may take place, or a sudden stop may be necessary on a slippery pavement. A driver may momentarily lose his sense of direction at night or in a fog when passing another car. All these things do happen, and if a wheel reaches the edge of a deep ditch nothing can save the car and its occupants from disaster. I had occasion to drive along a certain road west of Chatham last summer, which seemed to me to be just a dividing line between two canals. I admit, one gets the thrill of adventure, when traversing such a hog's back, but I predict that a good deal of money will be spent in the near future in correcting such mistakes of the past.

I have been practicing engineering in Oxford County for thirty-five years. During the first half of that period I was engaged chiefly in laying open ditches, and during the last half I have seen a large percentage of them filled, or partially filled, with tile because it was found expensive to maintain them to the depth required for subsoil drainage, and because they were an unsightly nuisance to the owners of the lands, and I predict that the same process of evolution will overtake the deep highway ditches.

Now having got that out of my system I will proceed to something else. Of course all of you know that Oxford is the model county of the Province, and if I describe the method pursued in Oxford County, that should be all that is required.

Procedure in Oxford County

All of the county roads of Oxford County are old established highways, graded, most of them gravelled, and with provision made for carrying off the surface water. When the "powers that be" decide that a certain road is to be improved under the county system the superintendent, accompanied usually by the reeve of the township, and sometimes the engineer, makes a trip over the road as soon as possible after the frost comes out in the spring, and decides in a general way along what parts of the road the existing open ditches should be supplemented by subsoil drains. They also inquire as to what available and what farm lands, if any, are likely to be affected by the drains to be constructed along the road or by the outlets which it may be necessary to construct through private property. The county has always co-operated with the owners of adjoining lands, and will put in any desired size of tile, upon terms agreed upon or determined by the engineer. The County usually pays the cost of a four inch tile drain; the difference in cost of the larger size, if required, is charged to the private owners.

The next step is to get the signatures of all such owners, if possible, to an agreement referring all such matters to the engineer, whose decision is said to be final, and usually is. If any owner objects to that feature of it, we insert a clause, reserving a right of appeal to the county judge. The course is then clear for the engineer to go on and stake out the drains previously decided upon, although in this respect he is usually allowed to exercise his own judgment.

A plan and profile are then made showing the location of the road drains and outlets, the depth of the drains, grades, sizes of tile, location of catch basins, etc. An estimate of the cost is made, and if any private owners are liable for a portion of the cost a short statement is prepared reciting the agreement previously referred to, referring to the plan, profile, specifications, and estimate attached, and reciting that the drains are to be constructed by the county and that by a certain date each of the owners shall pay to the county the sum of money set opposite his name. This is signed by the engineer and a liberal number of copies supplied to the superintendent. A copy should be filed with the township clerk for the purpose of record.

Location of Tile

The tile is usually laid on both sides of the road except when the natural slope of the land is away from the road on one side, in which case only the higher side of the road is tiled. In most cases the tile are laid in the ditch or gutter but from 2½ to 3 feet deeper, which usually means that the tile are about five feet below the crown of the road. This method, I think, gives as good results as a 3½ to 4 foot drain laid in the shoulder, and the digging costs 1/3 less. In springy spots where cross-drains are required I am of the opinion that these should be built of stone instead of tile as the latter are more easily displaced or stopped up.

It is important that the catch basins should be properly located and substantially built, otherwise they will soon become detrimental to the drain rather than useful. It is also important that the outfall should be protected by a first-class quality of concrete which will not deteriorate under the trying conditions to which it is usually subjected. Sometimes this should be in the form of a head-wall, but in many cases it is sufficient to encase the last six or eight feet of drain in a shell of three to one concrete about four inches thick. In any case the outlet should be easy to find so that it may be inspected and kept clear of obstructions.

Discussion

Mr. W. G McGeorge, engineer of Kent County, opened the discussion, stating the consideration of the subject of open drainage raises the point that the problem in every county is unique, it being necessary to consider the points of fall and capacity in determining the drainage of roads. He described the methods in draining Kent's roads and the natural conditions that influenced the design of the system employed. He favored the laying of tile in the ditch, but explained that the location of poles and trees on some of their highways prevented the working of the tile laying machine, necessitating the laying of tile in the shoulder of the road.

Mr. McLean defended the policy of deep drains, as specified by the Highway's Department, against Mr. Ure's criticisms. The important point in his defence was the absolute necessity of getting surplus water off the roads as quickly as possible in the spring, otherwise there is great danger of having the roads destroyed under traffic while in this unstable condition. He said it was the experience of the department that the deep open drain was the solution of this difficulty, the only alternative being a wide tile drain, the cost of which was prohibitive. This alternative had been adopted in places where the deep ditch was an inconvenient feature in obtaining access to places of business in small towns and hamlets, and on hills where it was unsafe for traffic, but the cost was too high for its general use.

Several other members followed with brief remarks on drainage conditions on highways in their respective localities and the methods employed for meeting them.

In reply to an enquiry as to the responsibility of the county, when widening a road, to supply drainage facilities for adjoining farm lands that have hitherto utilized the ditch for this purpose, Mr. McLean stated that he thought that some provision would have to be made for carrying away the farm drainage, equal to the facilities previously serving the owners of the land.

Another point that was discussed at some length was the liability of the county for the cost of constructing culverts over the drainage ditches at the entrances to farm lands. Many members stated their experience in this regard, some having stood the entire cost and performed the work of installation; some having supplied the material, the work being done by the farmer; others had assumed the responsibility for one entrance to each farm, while others disclaimed any responsibility in this connection. Mr. McLean stated that the highway department was acting on the best legal advice in providing these culverts at farm entrances on provincial roads Where we cut off the farmer's access to the highway with a deep ditch, we must supply him with a means of crossing that ditch, he stated. The putting in of this crossing was considered part of the road construction. It was the general opinion of the meeting that there should be some definite legislation placing this responsibility. The councils were not objecting to this expense, but wanted to know their exact position with regard to their responsibility.

Partners in the Contracting Business

Every contractor has two unwitting partners, Guy Leroy Stevick, vice-president of the Fidelity & Deposit Co., told the recent A. G. C. convention—his surety and his banker. The actual average net profit of the contractor is but little more than 5 per cent, though usually figured as twice that, Mr. Stevick said. "And I believe you will agree that the surety who gets one and a half per cent of the contract price has a sufficiently substantial interest in the profits to be called at least a limited partner," he said. "Then I think that experience would show that the average contract is financed outside of the actual capital of the contractor to about the amount of the reserve percentage—say an average of 15 per cent. That means at 7 per cent interest a charge of something more than one per cent of the contract price. So that we have as the possible interest of the three a matter of between 5 and 10 per cent for the contractor and two and a half per cent divided between the banker and the surety. Thus three interests are vitally interested in the venture."

The Contract Record's

Weekly House Suggestion No. 60

Our house subject this week is a handsome brick and stone residence, of the Colonial type, which will shortly be erected for Mr. A. H. Cameron, at Peterboro, Ont. The layout of the rooms is very simple, but convenient, as a glance at the accompanying plans will indicate.

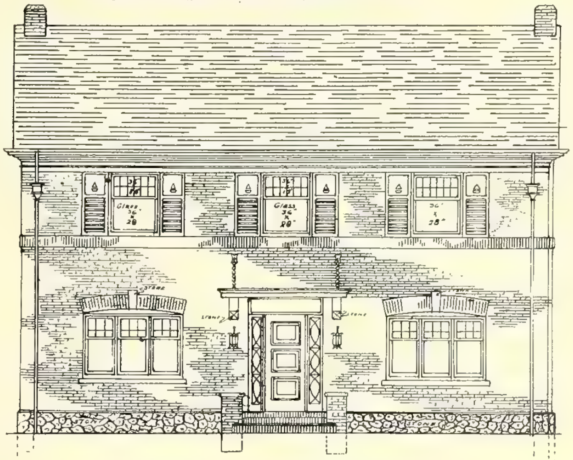
The construction details are as follows: foundation of stone and walls of brick, metal bound, strapped, lathed and plastered; roof of green shade asphalt slate shingles; division walls in basement of concrete, 8" thick, and basement floor of concrete.

The interior trim will be in birch, finished walnut in the dining room and ivory enamelled in the living room and hall, while all doors, stair rail and treads will be mahogany finished. The plastering in the dining room, living room and hall is to be sand finished stucco. The rooms are all large and the spacious living room will be equipped with a fireplace and direct entrance on rear verandah. The kitchen will be finished in French grey enamel and equipped with built-in ironing board, broom cupboard and opening to laundry chute. The flooring throughout both floors will be of red oak, polished.

All bedrooms upstairs are to be finished in white enamel and provision has been made for several roomy linen and clothes closets in the various rooms.

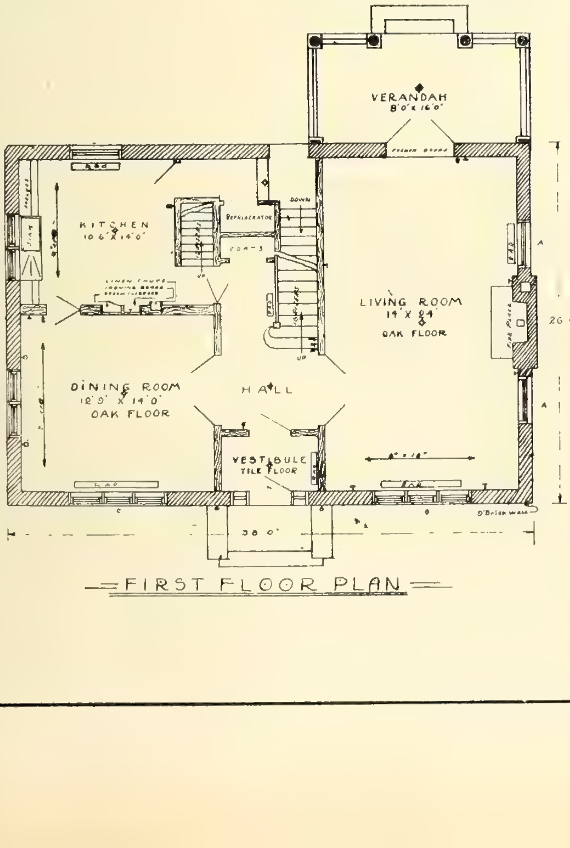
The basement plan is divided into laundry, storeroom, furnace room and coal space. The heating plant will be a No. 5 Safford Hot water boiler.

—BASEMENT PLAN—

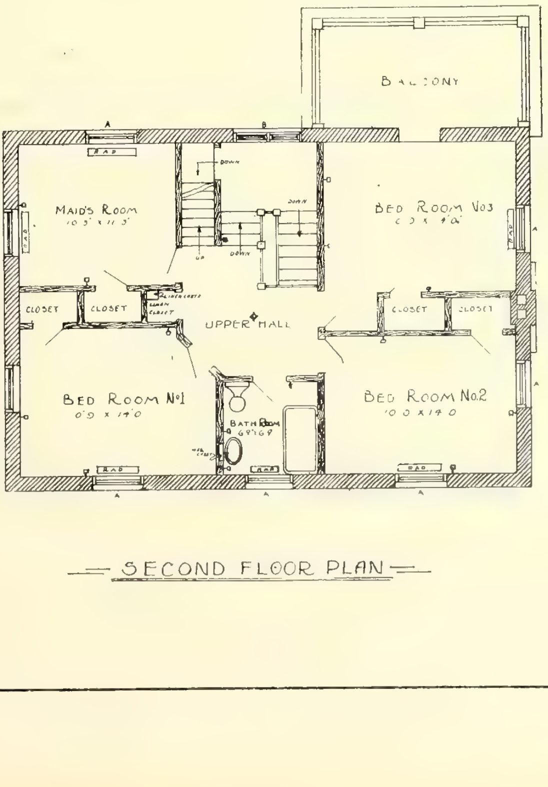


—FRONT ELEVATION—

Messrs. Chas. H. Huffman & Son, of Peterborough, are the designers of this very attractive home.



—FIRST FLOOR PLAN—



—SECOND FLOOR PLAN—

Mainly Constructional

East and West—From Coast to Coast

General Manager E. V. Buchanan, of the Public Utilities Commission, London, recently announced that the waterworks department had a cash surplus of over $10,000 after meeting all operating costs for 1922, as well as interest and sinking fund charges on the debenture debt. The gross surplus, before these capital deductions are made, amounts to $122,000.

The town of Oakville has agreed to pay $18,000, its share towards the construction of a high level bridge on the Toronto-Hamilton highway in the town. This is the last link of the highway and one that has been delayed for considerable time. The county of Halton has agreed to pay a like amount and the balance of the cost, $97,000 will be borne by the province. Construction will be started, it is anticipated, early in May.

A delegation representing the municipalities of North Bay, Sturgeon Falls, Sudbury, Callander and New Liskeard, Ont., as well as members of the Timiskaming and Northern Ontario Railway and local provincial members waited on Hon. James H. King, Minister of Public Works, Sir Lomer Gouin, Minister of Justice, and Hon. Thos. Low, recently, asking the government for an appropriation of $150,000 to be spent in French River development for power purposes. Mr. King promised that the matter would be submitted to the cabinet council.

The contract for the Kenogami Dam, which will dam the Chicoutimi and Sable rivers in Kenogami, Lake St. John, P. Q., was let a few days ago to the Nova Scotia Construction Co., of Montreal and Halifax, at $985,682. The contract calls for the completion of the work by November, 1924. The entire village of St. Cyric, with its pretty parish church, its school, public and private buildings, stores and residences, will be either demolished or moved to another location to make room for the great reservoir resulting from the construction of this dam. The village is on a low level and the land will be covered by the waters of the new reservoir. The cost of moving the village and compensating the residents for their losses, will amount to between $500,000 and $700,000.

Building permits issued for the first two months of this year at Toronto, total over $3,500,000. The January and February totals of 1922, itself the record year of Toronto's history, have both been surpassed, and indications are that a new building record will be established this year by the City Architect's Department.

A start has been made on the excavation for the new "Elgin" telephone exchange, at the corner of Sheppard and Temperance Streets, Toronto, for the Bell Telephone Company. The building will ultimately be a twelve storey structure, although only eight floors will be built at the present time. The building will be of steel frame with brick and stone exterior and reinforced concrete floors. The contract was let for $170,000.

The council at North Bay, Ont., have authorized the issuing of debentures to the amount of $65,000 for the building of a six-room addition to the Collegiate Institute there.

It is anticipated that the work in connection with the installation of the new water works system at Port Credit, Ont., will be completed soon and water will be turned on in about a month's itme. The new system is costing $100,000.

A statement credited to H. B. R. Craig, chief engineer of the federal department of public works is to the effect that important development of western Ontario's Great Lakes harbors is planned at Port Burwell, Port Stanley, Port Maitland and Rondeau to handle the coal coming across Lake Erie. At Sarnia it is further stated, in connection with the development of the St. Clair river, there will be important dredging operations carried out as well as the improvement of Fighting Island channel, in the Detroit river, the upper end of which is some six miles below Windsor. Four million cubic yards of silt must be dredged to obtain a uniform depth of 21 feet in that channel. That effected, a considerable relief in present congestion of the river will be noted.

A new three storey school building of 30 rooms is to be built in the Silverthorn district, Toronto, soon. A start will be made on the first twelve rooms, to meet the urgent demand for accommodation, at a cost of $100,000. The entire structure, when completed, will cost approximately $250,000.

Personal

Mr. M. H. MacLeod, vice-president in charge of construction, Canadian National Railway lines, has resigned this position, according to a recent announcement from Ottawa. Mr. MacLeod has been appointed consulting officer to the new executive.

Obituary

Mr. Charles Holbrook, well known Ottawa contractor, died in that city recently from heart disease. Deceased was 70 years of age.

Mr. Alexander C. Bryson, prominent contractor of Winnipeg, died there a few days ago, age 77. He was born at Lindsay, Ont.

The recent death of Mr. Roderick Cameron, at Oakville, Ont., will be regretted by all those who were acquainted with his accomplishments in landscape architecture. He was born 71 years ago and served his apprenticeship in Rosshire, Scotland, coming to Canada as a young man and working at his trade of landscape architecture. Serving an apprenticeship in the old days meant learning several trades, consequently Mr. Cameron was thoroughly versed in the art of drainage and building bridges, retaining walls and similar structures. In Canada, Mr. Cameron was responsible for a great many splendid park developments, including the present Queen Victoria Niagara Falls park system and most of the Toronto parks system.

Trade Incorporations

Belmont Construction Co. Inc., with head office at Montreal, capital $500,000, to carry on a general construction business.

Toronto Cement Corporation, Ltd., with head office at Toronto, capital $3,000,000, to manufacture and deal in Portland cement, limestone, etc.

Gladman Construction Co. Ltd., capital $40,000, head office at Toronto, to carry on a general contracting and building business.

McRitchie & Black, Ltd., with head office at Montreal, capital $20,000, to carry on the business of builders and contractors.

Badgley Construction Co., Inc., with head office at Montreal, capital $49,900, to carry on a building and real estate business.

Standard Supply Co. Ltd., with head office at Montreal, capital $20,000, to manufacture and deal in roofing and paving materials.

CONSTRUCTIONAL ACTIVITY

Period of March 7 to March 13, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Hamilton, Ont.
City contemplates a sewer on Cumberland St. S. H. Kent, clerk.

Re-blocking of street car tracks on Barton, James and Herkimer Sts., contempalted by the council. S. H. Kent, clerk.

City contemplates opening Hunter Street. Clerk, S. H. Kent.

Storm sewer costing $27,000 contemplated. S. H. Kent, clerk.

Moncton, N. B.
Concrete sidewalks costing $15,000 planned by the city. Under the supervision of J. Edington, engineer, this work will probably proceed in June.

Ottawa, Ont.
City will call for tenders in April for surface work on $24,000 pavement. A. F. Macallum, Commissioner of Works.

Watermain contemplated by the city. A. F. Macallum, Commissioner of Works.

Province of Quebec
Tenders are being received by the Provincial Government until Mar. 27 for the construction of the Quebec-St. Simeon Highway in the Village of Giffard and the Levis-Rimouski highway in the town of Lauzon.

Southampton, N. B.
William D. Steeves, Woodstock, N. B., has the general contract for concrete arch culverts and a road diversion costing $5,000 for the Provincial Government.

Tillsonburg, Ont.
Sidewalks contemplated by the town. M. Ostrander, Chairman of the Street Commission.

Watermains proposed by the Town Council. A. E. Simons, Chairman of the Water & Light Commission.

Macadam road under consideration by the Council. M. Ostrander, interested.

CONTRACTS AWARDED

Collingwood, Ont.
Council contemplates laying of an intake pipe at a cost of $12,000. Capt. Carson, Midland, Ont., general contractor.

Railroads, Bridges and Wharves

Amherst, Que.
Provincial Government contemplates a bridge. I. E. Vallee, Department of Public Works, Quebec, engineer.

Coverdale, N. B.
Tenders will be received until Mar. 21 by the Provincial Government for a concrete bridge.

Kentville, N. S.
Tenders are wanted by the Dominion Atlantic Railway, Kentville, for two stations costing $2,500 each. One to be erected at Paradise and the other at Clementsport. Tenders close on Mar. 24.

Salisbury, N. B.
Tenders are being received until Mar. 21 by the Provincial Government for a concrete bridge.

Saugeen Twp., Ont.
Canadian Des Moines Steel Co., Chatham, has the contract for steel and Keyes Bros., Kincardine, the contract for abutments for a steel and cement bridge. F. B. James, Box 206 Walkerton, engineer.

CONTRACTS AWARDED

Grand River, Que.
The Provincial Government has awarded the general contract for a wharf extension to M. Bernatchez & Geo. Fournier, Montmagny, at $23,314.

Southampton, N. B.
The general contract for a bridge has been awarded W. D. Steeves, Woodstock, N. B., by the Provincial Government.

Public Buildings, Churches and Schools

Beachburg, Ont.
W. C. Keighley, Pembroke, is preparing plans for the school board for a $40,000 school. Jas. Bennie, Beachburg, is secretary of the board.

Eganville, Ont.
The Public School Board will re-build the $30,000 school destroyed by fire. Secretary, Mr. Gourley. Architect not yet appointed.

Ford, Ont.
Windsor Glass Co., Hall Ave., have the glazing contract for the building being erected by the trustees of the Methodist Church.

Fredericton, N. B.
Board of Education plans to secure Park Barracks and convert it into a High School. R. D. Hanson, secretary, School Building.

Giffard Village, Que.
Plans are being prepared for a boarding school for the Rev. Sisters Oblates by Bergeron & Lemay, 145 St. John St., Quebec.

Hamilton, Ont.
Plans are being prepared for a collegiate and tenders will be called about Apr. 1. R. H. Foster, secretary.

Hutton & Souter, Bank of Hamilton Bldg., are preparing plans for a school to be built near Hamilton.

Kingston, Ont.
Tenders for plumbing, electric wiring, heating and ventilation of the University library will be called shortly.

Kitchener, Ont.
Tenders for car barns, costing $40,000 are being received by Geo. Clarke, secretary of the Light Commission, until Mar. 21.

Montreal, Que.
Roman Catholic School Commission may remodel and make an addition to a school this spring. Chas. David, 3 Burnside Place, architect.

Niagara Falls, Ont.
C. M. Porter, 102 Main St., architect, will receive tenders until Mar. 22 for the Sunday School and addition to Lundy's Lane Methodist Church.

Oshawa, Ont.
Town Council contemplates a Grandstand costing $20,000. By-law will be submitted to the ratepayers shortly.

Ottawa, Ont.
Tenders are being received by the Auditorium of Ottawa Ltd. until Mar. 26 for the $300,000 structure. Richards & Abra, architects.

City will alter Police station to the extent of $10,000 according to plans prepared by Chief Ross.

Pembroke, Ont.
Tenders will be received for the $100,000 school until Mar. 31. W. C. Keighley, 56 Pembroke St., architect. Mrs. N. S. G. Irving, secretary of the School Board.

Punnichey, Sask.
This school district contemplates a school costing $20,000. By-law will be submitted soon.

Quebec, Que.
Tenders will be called about the end of the month for the rebuilding of the Basilica. Tanguay & Chenevert, 20 D'Aiguillon St., architects.

The Seminary of Quebec is having plans prepared for forestry and medicine schools. Bergeron and Lemay, 145 St. John St., Quebec, are the architects.

Riverside, Ont.
The Catholic Church, c/o Bishop, London, Ont., contemplates a $30,000 church. Architect not appointed.

St. John, N. B.
The Church of England Institute is having F. Neil Brodie, 42 Princess St., prepare sketch plans for a $15,000 memorial hall.

St. David's Church plans to add two storeys to a basement already built and F. Neil Brodie, 42 Princess St., is preparing plans for $30,000 structure. Rev. A. R. Crookshank, 77 Duke St., rector.

Sherbrooke, Que.
Plans for a Masonic Temple, costing

$22,000, prepared by H. G. James, architect.

H. G. James, Sherbrooke, prepared the plans for the new High School, to cost about $100,000.

Toronto, Ont.
Board of Education contemplates six and seven room additions to two schools. Sec.-treas., W. W. Pearse, 155 College St.

St. Columba Presbyterian Church contemplates a new Sunday School costing $50,000. Chas. H. Nave, 65 Lauder Ave., Chairman of the building Committee. Architect not yet appointed.

Ossington Baptist Church will appoint the architect for the contemplated Church and Sunday School next month. C. E. Lillie, 207 Concord Ave., chairman of the Finance Committee.

Verdun, Que.
City contemplates an incinerator. J. E. Noel, engineer.

Waterloo, Ont.
Tenders will be received by W. H. E. Schmalz, 288 Frederick St., Kitchener, for the $40,000 college for the Lutheran Seminary.

Woodstock, Ont.
Tenders are being received by Sproatt & Rolph, 36 North St., Toronto, for the addition to the hospital at a cost of $100,000 until March 21.

York Twp., Ont.
Tenders for a school for S.S. No. 30 are being received by Gordon & Helliwell, architects, Confederation Life Bldg., Toronto, until March 9.

CONTRACTS AWARDED

Etobicoke Twp., Ont.
Contracts on the school for S.S. No. 11 let as follows: Painting, W. Lockhart, Humber Bay; masonry, Caron & Oakley, 12 Oliver St., Humber Bay; carpentry, T. Stacey, Humber Bay; roofing, Robt. Rae, Humber Bay; electrical, Warren & Fordyce, Humber Bay; plumbing and heating, J. H. Doughty, Mimico; plastering, R. C. Dancy, 57 Kendal Ave., Toronto.

Montreal, Que.
The contract for metal covered doors for Notre Dame Hospital has been awarded to M. Chouinard, 751 Adam St.

Newmarket, Ont.
W. E. Richardson has been awarded the general contract for the $55,000 addition to Newmarket school.

Ottawa, Ont.
The contract for a service building for the hospital awarded to Ross Meagher Co., Elgin St. at $134,979.

Rimouski, Que.
The contract for steel for the $600,000 seminary awarded to Eastern Canada Steel & Iron Works at $17,027. Pierre Levesque, architect, 115 St. John St., Quebec.

Toronto, Ont.
City Council has awarded the masonry contract for the Riverdale shelter buildings to Gratton Ltd., 486 Clinton St. and the masonry contract to J. J. Murphy, 264 Ontario St., at $3,200.

H. N. Dancy & Son Ltd., 22 College St., have the masonry contract for Eglinton Presbyterian Church. Langley & Howland, York Bldg., architects.

Gordon & Helliwell, Confederation Life Bldg., Toronto, have been appointed the architects for Christ Church R. E. Right Rev. Willard Brewing, 491 Euclid Ave., rector.

Weston, Ont.
Contracts of the Industrial school awarded as follows: Reinforced steel, Burlington Steel Co., 60 King St. W.; structural steel, Hepburne & Disher Ltd., 71 Van Horne St.; steel sash, Architectural Bronze & Iron Works, Lansdowne Ave. All are Toronto companies.

Business Buildings and Industrial Plants

Edmonton, Alta.
Massey Harris Co. Ltd. will build an addition to a warehouse at a cost of $7,600.

Elgin House, Ont.
L. Love & Son are having plans prepared for an annex to the hotel, costing about $65,000.

Glencoe, Ont.
C. C. Morrison, Fort Erie, Ont., negotiating with the council for the erection of a flour mill.

Glace Bay, N. S.
Work will start shortly on an hotel costing $100,000 for the Glace Bay Hotel Company. J. C. Douglass, Glace Bay, S. P. Challoner, Sydney and Daniel Sullivan, c/o Glace Bay, directors.

Guernsey, Sask.
Work has commenced on a grain elevator costing $12,000 for Lake of the Woods Milling Co. Ltd., Winnipeg. R. O. Benell, Moose Jaw, general contractor.

Hamilton, Ont.
Hamilton Tar Products contemplate an addition to their factory and an office building costing $5,000. J. A. McMaster, manager.

Orange Crush Bottling Co., is excavating for a factory costing $20,000. W. H. Cooper & Co., Clyde Block, builders.

F. J. Rastick, 150 Jackson St., wants tenders on stores and apartments costing $20,000.

J. E. Lister, 133 Glenfern Ave., wants tenders on wrecking a building and removing the debris.

Milverton, Ont.
Work will commence shortly on a $10,000 printing plant for Malcolm McBeth.

Montreal, Que.
Plans are prepared for a plant for the National Cement Company, 90 St. James St. Louis Hurtubise, 90 St. James St., chief engineer.

Application made by R. P. Rivert, 210 Desormeaux St., for permission to build a public garage. If this permit is granted, work will proceed at once.

Prince Rupert, B. C.
Stores and apartments costing $20,000 proposed by L. O. Larsen, McBride Rooms, who is having plans for these structures prepared by J. W. Potter, Prince Rupert.

Saskatoon, Sask.
Bank of Montreal contemplates having the old Merchants Bank premises remodelled into a store at a cost of about $7,000.

Sorel, Que.
On Mar. 14, E. A. Doucet, 195 St. Catherine St., will call for tenders on an hotel. A. Demaris, manager of the Balmoral Hotel, interested.

Springhill, N. S.
F. Neil Brodie, 42 Princess St., St. John, is preparing plans for a theatre costing $20,000 for Miss M. J. Anderson.

Toronto, Ont.
Bulk and separate tenders on offices and a cafeteria being received by H. W. Steele, 756 Coxwell Ave. Mr. Wilson, c/o architect, owner.

Lannan Bros., 969 Bloor St., will commence at once to build two stores and apartments.

Plans are drawn for a candy factory for Hunts' Ltd., 70 Alcorn Ave. D. H. Burnham, 260 Lauder Ave., architect.

C. B. Sears, 325 Roehampton Ave., excavating for two stores for Dr. Jukes Johnson Estate.

P. L. Davis, 309 Gerrard St. E., is preparing plans for a $40,000 bowling alley for Max Goodman, 71 Brunswick Ave.

C. Davis Goodman, 14 St. John St., Montreal, is preparing plans for a $40,000 warehouse for the Halpern Estate.

Tenders for the balance of work, including everything but excavating and footings, for the Coca Cola Plant will be called shortly by Harkness, Loudon & Hertzberger, Confederation Life Bldg., Toronto.

Public garage contemplated by Art. Pearce, 1751 St. Clair Ave., W. Tenders will be called for all trades.

White Rock, B. C.
P. Rickard, White Rock, B. C., will shortly commence work on stores and apartments costing $10,000.

Willowdale, Ont.
North York Township contemplates an office building. H. D. Goode, Lansing, Ont., clerk. Architect not yet appointed.

Windsor, Ont.
Seguin Bros., 906 Brant St., are having plans prepared for a business block.

About the end of March tenders will be called for a $100,000 factory for Kilgour Bros., 21 Wellington St. W., Toronto. D. C. Cotton, 54 Adelaide St. W., Toronto, architect.

Woodstock, N. B.
Work will start at once on a $19,000 theatre for F. G. Spencer, 95 Charlotte St., St. John. Forbes and Brown, South Devon, York Co., are the general contractors and have not yet purchased material.

CONTRACTS AWARDED

Ford, Ont.
White Plumbing & Heating Co., Lon-

don St., have the contract for roofing, sheet metal, plumbing and heating for the machine shop and garage being built for Merlo, Merlo & Ray, Ford City.

Quebec, Que.
The plumbing, heating and electrical contracts for alterations of a warehouse into a store and office building at a cost of $40,000 have been awarded to Brousseau & Frere, 324 St. Paul St. Painting and glass contracts awarded to Gautheir & Frere, 292 St. Joseph St.

St. Hyacinthe, Que.
General contract for a factory for C. U. S. Knitting Mills has been awarded to Newton Dakin Construction Co. Ltd., 115 Stanley St., Montreal.

Three Rivers, Ont.
Contract for roofing the extension to Wabasso Cotton Co's. mill awarded to Keystone Fireproofing Co. Painting, Johnson-Lamarre Ltd., 285a Sherbrooke St. W., Montreal.

Toronto, Ont.
Feather & Roadhouse, 11 Foster St., have the roofing contract; Wm. G. Crawford, 99 Adelaide St. W., the plumbing and heating contracts and R. C. Dancy, 57 Kendal Ave., the plastering contract for the alteration to the Bell Telephone building on Adelaide St.

Bennett & Wright Co. Ltd., Queen St. E., have the heating contract for the $100,000 addition being made to the plant of Macdonald Mfg. Co., 145 Spadina Ave.

W. H. Miles & Co., 188 Dupont St., have the heating contract for the garage and showroom being built by Claude Pearce. The electrical contract has been awarded to Canadian Electrical Co., foot of Yonge St.

Vancouver, B. C.
The general contract for foundations and trestle for a grain elevator for E. A. Woodward Co. Ltd., Winnipeg, has been awarded to Dominion Construction Co. Ltd., 509 Richards St., Vancouver.

City of Vancouver has awarded the contract for a garage to Geo. C. Sutherland, 23rd Ave. E., at $23,745.

Welland, Ont.
The general contract for the building for Welland Cotton Mills Ltd., has been awarded to C. Yates Construction Co. Ltd., 17 Main St. E.

Standard Steel Construction Co., 55 Main St., have the contract for steel for the building being built by Welland Cotton Mills Ltd.

Residences

Brantford, Ont.
Tenders will be called shortly for a $22,000 brick and stucco residence for Dr. J. A. Phillip by H. R. Watson, arhcitect, Excelsior Life Bldg., Toronto.

Bridgeburg, Ont.
Tenders are wanted by Dr. J. Burke, 1092 Main St., Buffalo, N. Y., for a $10,000 residence. Oscar Teal, Bridgeburg, architect.

Duck Lake, Sask.
Gustave Mandin, Duck Lake, will commence work in the spring on a residence costing $6,500.

Kingston, Ont.
Bulk and separate tenders for a $14,000 residence for D. M. Chown will be received until Mar. 19 by Page & Warrington, architects, Confederation Life Bldg., Toronto.

London, Ont.
E. Patterson, c/o Cohoon & Patterson, 608 Maitland St., is having plans prepared for a residence to cost about $8,000. W. G. Murray, Dominion Savings Building, architect.

D. Teasdall, c/o Teasdall Hosiery Mills, Ridout St., contemplates a residence costing $7,500.

Milverton, Ont.
Plans are drawn for a residence costing $8,000 by J. Russell, Downie St., Stratford for N. H. Honderich, Milverton.

S. J. Miller, Millbank, Ont., proposes to build a residence costing $6,000.

Minett, Ont.
Summer home costing $10,000 being erected by Mr. Minett.

Montreal, Que.
L. Forgues, owner and builder, 1558 Chabot St., is excavating for a $6,000 residence to be completed by the end of May.

A. Lamontagne, 577 Fabre St., is building a residence costing $7,500.

A. T. Dunnett, 918 Des Carriere Rd., is excavating for a $12,000 residence for G. A. Weatherby, 343a-6th Ave.

Six flats contemplated by R. Benoit, 3227 St. James St., who proposes to proceed with the work in May.

Oshawa, Ont.
By-law passed authorizing the sale of $200,000 worth of debentures to enable the Housing Commission to proceed with its building program. G. H. McLaughlin, 261 Simcoe St. N., member of the Commission.

Ottawa, Ont.
Tenders are wanted by Noffke, Morin & Sylvester, Central Chambers, on an apartment house costing $18,000.

A $6,000 residence is contemplated by L. Brethour, Rosberry Ave.

Caleb Brooks, 590 Driveway W., has the foundations in for a residence to cost $6,000.

Outremont, Que.
Ten cottages, costing $90,000 contemplated by Guidazio & Besozzi, Stuart Ave.

Quebec, Que.
D. S. P. Gagne, St. Isodore, contemplates a residence costing $15,000. J. S. Bergeron, St. John, Que., architect.

A $10,000 residence is contemplated by J. Roy, St. Anselme. The general contractor is Nap. Roy, St. Isidore, who will buy all material and let sub-trades.

Rockland, Ont.
Camile Raymond contemplates a $7,000 residence. Fabrien Brunch, architect.

Sherbrooke, Que.
H. C. James has prepared plans for a $9,000 residence for Dr. E. A. Tomkins.

Stratford, Ont.
Wm. Newman, 55 Cherry St., contemplates 20 dwellings costing $60,000.

Three Rivers, Que.
Donat Beliveau, 27 Angonlene St., is excavating for a residence to cost $6,000.

Toronto, Ont.
F. A. Feilder, Hampton Ave., has the foundations in for an $11,000 residence. J. Hunt Stanford, Yonge St. Arcade, architect.

J. A. Harvey, 2 Gould St., will commence work shortly on a $9,000 residence.

Fred W. Hickley, 289 Keewatin Ave., excavating for two pair or residences costing $16,000.

Fred J. Male, Lakeview Apts., is building a $12,000 residence in Runnymede.

Robert Aspinall, 310 Oakwood Ave., is building a residence costing $9,000.

$7,000 residence contemplated by M. Sewell who is having plans for the building prepared by P. L. Davis, 309 Gerrard St.

Four residences costing $40,000 will be built by Soudan Realty Co., Toronto St., which is receiving tenders through H. R. Watson, architect, 3 Toronto St.

L. Macauley, 42 Alberta Ave., has the foundations in for an $11,000 residence. Geo. Case, 569 Christie St., is the general contractor.

Five pair of residences costing about $8,000 a pair will be built this spring by J. Carr, 4 Oakdene Cres.

Plunkett Bros., 99 Glenholme Ave., have started a residence costing $9,000. D. McMillan, 373 Montrose Ave., builder.

Verdun, Que.
Perras & Goulet, 1501 Wellington St., will shortly commence work on six flats costing $12,000.

Five flats, costing $18,000, contemplated by L. Genest, 135 Rielle St.

Windsor, Ont.
Frank Pickells, 1451 Dougall Ave., has excavated for an $8,000 residence.

CONTRACTS AWARDED

Outremont, Que.
J. A. Roch, 793a Champagneur Ave., has awarded the tiling contract for a $18,000 residence to E. Lepage, 990 Parthenais St. The electrical contract was awarded to Acme Electrical Co., 1012a Laurier St.

Toronto, Ont.
Wm. Clubb, 178 Argyle St., has the general contract for two pair of residences for Hubbs & Hubbs, 134 Victoria St., costing $15,000.

Contracts on 66 residnces under construction for G. F. Skipper, 67 Pine Cres., awarded as follows: Electrical, Nichol & Fagan, 111 Logan Ave.; plumbing, L. Hollows, 1564 Danforth Ave.; plastering, J. Thompson, 45 Gledhill Ave.

P. R. Page, 18 Toronto St., has the masonry contract; G. F. McKenzie, 252 Earlscourt Ave., the carpentry contract; Reggin & Taylor, Front St., the roofing contract; and Fred Roberts Co. Ltd., Wells St. the painting contract for the residence being built for E. L. Ruddy, 317 Spadina Ave.

The general contract for a residence costing $18,000 for Mrs. Boyd, 411 Dan-

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

Tenders for Asphalt Resurfacing

Sealed tenders, marked "Tender for Asphalt Resurfacing," addressed to Alderman Alex. Jaffrey, Chairman, Board of Works, in care of City Clerk, Guelph, Ontario, will be received until 12 o'clock noon.

Thursday, March 29th, 1923,

for the resurfacing of certain streets with asphalt.

Specifications may be seen and form of tender obtained at the City Engineer's Office, Guelph, on and after March 13th, 1923.

The lowest or any tender not necessarily accepted.

H. S. NICKLIN,
City Engineer.

City Engineer's Office,
Guelph, March 8, 1923. 11-12

TENDERS

Sealed tenders plainly marked as to contents, and addressed to the undersigned will be received up to 12 o'clock noon, **Tuesday, March 27th, 1923**, for the erection of a

Concrete Block and Stucco Exhibition Building

at Brampton, Ont., for the Peel Agricultural Society.

Plans and specifications and tender forms may be be obtained from the Secretary or at the Office of Smith & Wright, Architects, Dominion Bank Chambers, 2945 Dundas St. W., Toronto, on and after Monday, March 19th.

A deposit of $10.00 is required to assure the return of the plans.

The lowest or any tender not necessarily accepted.

J. H. WATSON, Sec.
Peel Agricultural Society,
11 Box 668, Brampton, Ont.

Extension of Time

Court House and Goal

County of Haldimand

Bulk tenders for all trades (except Heating and Plumbing) required in the erection and additions to Court House and Goal at Cayuga, Ontario, will be received by R. S. Colter, Cayuga, Ontario, up to 5 P.M.,

March 30th, 1923,

Bidders are also requested to submit tenders on a cost plus basis with the limit of cost.

Separate tenders will be received for Heating and Plumbing.

NOTE—Tenders for the installation of water and sewage system to be called for later.

Plans and Specifications may be seen, after March 17th, 1923, at the office of R. S. Colter, Cayuga, and at the offices of Frank Barber and Associates Limited, 45 Jarvis St., Toronto, and the Union Bank Building, Dunnville, Ont. (E. Hinchcliff, Resident Engineer.) 11-12

RATES

20 cents per agate line (14 lines to the inch) Positions Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

Tenders Wanted

Tenders addressed to the Architect endorsed "Tender for East Ward School, Pembroke" will be received until 12 o'clock noon

March 31st, 1923,

for the erection of Public School.

Plans and Specifications may be seen on or after March 10th at the office of W. C. Keighley, Architect, Grand Trunk Offices, Pembroke, Ontario; or Plans and Specifications may be obtained by depositing with the Architect a certified cheque for $50.00 which will be refunded upon return of the plans and specifications and the receipt of a bona-fide tender.

All tenders must be accompanied by a certified cheque for five per cent of the amount of the tender.

A Guarantee Company's Bond for ten per cent of the amount of tender will be required when contract is signed. Five per cent deposit will be returned upon execution of Bond.

The lowest or any tender will not necessarily be accepted.

Bulk bids only will be considered.

R. L. McCORMACK,
Chairman Board of Education,
10-11 Town of Pembroke, Ont.

TENDERS

Sealed tenders addressed to Dr. W. E. McNeill, Registrar Queen's University, Kingston, Ont., will be received up to noon of **29th March, 1923**, for Roofing and Sheet Metal, Plumbing, Heating and Ventilating, Electric Wiring, Lathing and Plastering, Steel Casement Window Frames and Sash, required for

Library Building, Queen's University, Kingston

Each tender must be accompanied by a marked cheque to the order of Treasurer, Queen's University, for 5% of the amount of the tender. Cheques of unsuccessful tenderers will be returned after contracts are awarded.

Performance Bonds shall be furnished at Owner's option and expense, by the successful tenderers.

The Owners reserve the right to reject any or all tenders.

Drawings and specifications may be seen at Registrar's Office, Queen's University, Kingston, and at Builders' Exchange, Toronto; or they may be had upon deposit of $15.00 for their safe return by applying to the Architects.

SHEPARD & CALVIN,
36 Toronto St.,
11 Toronto.

CONSTRUCTION SUPERINTENDENT with 15 years experience handling all classes of building and water work, wants position. A1 testimonial and guarantee results. Will go anywhere Box 147, Contract Record, Toronto. 8-10

Notice to Electrical Contractors

Sealed tenders addressed to the Queen Victoria Niagara Falls Park Commission at Niagara Falls, Ontario, will be received by the undersigned until 12.00 o'clock noon, **March 24th, 1923**, for the installation of a

Park Lighting System

Specifications may be seen and form of tender obtained at the Administration Building, Niagara Falls, Ontario. Each tender must be accompanied by a marked cheque for $1,000.00, payable to the Park Commissioners.

The lowest or any tender not necessarily accepted.

JOHN H. JACKSON,
11-12 Superintendent.

CITY OF BRANTFORD

Tenders for Reinforced Concrete Arch Bridge

Sealed Tenders marked "Tender for Lorne Bridge" addressed to Ald. C. S. Moyer, Chairman Board of Works, in care of the City Clerk, Brantford, Ontario, will be received until 12 o'clock noon

Saturday, March 24th, 1923

for the construction of a three span reinforced concrete arch bridge, approximately five hundred feet long and sixty four feet wide, across the Grand River.

Plans and specifications may be seen and Form of Tender obtained at the City Engineer's office, Brantford on and after Monday March 5th, 1923.

The lowest or any tender not necessarily accepted.

FRANK P. ADAMS,
City Engineer.

City Engineer's Office,
Brantford, February 27th, 1923. 10-12

FOR SALE

Keystone Excavating Machine, complete with two sticks, skimmer scoop, and three ditching scoops; this machine has been used only one season and is guaranteed to be in first class condition. Price $4,500 f.o.b. St. John, N. B.

Austin Backfiller with caterpillar traction, 4-cylinder Buffalo engine, in equally good condition. Price $2,500 f.o.b. St. John, N. B. Canada Lock Joint Pipe Limited, 65 Pleasant Boulevard, Toronto, Ont.; or St. John, N. B. 6-T.f.

STEEL PILING

Bought and Sold

Universal Equipment Company

Niagara Falls. 11-T-f.

WANTED

Rent or buy—one small Dredge, on a small job. Suitable for dredging a small creek half yard dipper or smaller required. Reply to Bryson & Irwin, Wiarton, Ontario, Contractors 8-11

Some One Wants to Buy

The equipment or machinery that you are not using.

It may be occupying valuable space in your yard or shop, collecting dust, rust and hard knocks.

Sell it before "Depreciation" scraps it.

Use the Tender & For Sale Department. It helps others, let it help you.

FOR SALE

1 60 H.P. Waterous Locomotive Type Boiler.
1 40 H.P. Vertical Engine.
1 30 H.P. Vertical Engine.
1 25 H.P. Vertical Engine.
2 3" - 2" Steam Pumps.
1 60' c to c belt elevator 26" belt 24" buckets.
1 24" x 24" Friction Hoist.
23 2 cu. yd. 4' gauge Quarry Cars.
1 150 H.P. Erie City Steam Engine.
1 48" Revolving Screen.
1 Traction Engine.
1 Feed Water Heater.
Several 6" Steam Gate Valves.
2 Locomotive Air Pumps.

All above machinery can be seen at our plant, Hagersville, Ontario.

8-11 Hagersville Quarries, Limited.

FOR SALE

All Steel Revolving Guy Derrick

Capacity—10 Tons.

Mast 90 ft. High. Boom 80 ft. Long. Both in Sections about 30 ft.

Complete with Bull Wheel, Sheaves, Pins, etc. No Cable or Guy Ropes.

PRICE: $850.00 f.o.b. cars, New Glasgow, N.S.

This Derrick was Built for our own Erection Department and is First Class in Every Particular.

THE MARITIME BRIDGE CO. LTD.,
11 New Glasgow, N.S.

SHEFFIELD FIRM OF STEEL AND TOOL MANUFACTURERS are desirous of appointing an agent for Canada, and with this in view invite applications from firms of repute well known to Steel Consumers and Government Departments. Must understand the Steel Trade thoroughly and be capable of large volume of business. Write fully to "BRITISH" C/o Street's, 30, Cornhill, London, England. 10-11

A Service to the Profession

Every man wishing to tender must first see the plans and specifications.

If the plans are in Montreal and he is in Vancouver the inspection is a problem. We, however, with your assistance, are able to solve it. Place them on file at any or all of the offices of the "Contract Record" throughout the Dominion.

Contractors, engineers and allied manufacturers read the "Contract Record." It is the logical publicity medium for the announcement of tenders wanted.

Send us your plans. They will receive the best of care.

A room is reserved in each of our offices for examination of your plans by possible bidders.

Contract Record and Engineering Review

Toronto	345 Adelaide St., W.
Montreal	119 Board of Trade Bldg.
Winnipeg	302 Travellers' Bdg.
Vancouver	106 Winch Bldg.

CITY OF KITCHENER 1916

CITY OF KITCHENER

PAVEMENTS

Sealed Tenders plainly marked as to contents will be received by the undersigned up to 5 P.M., March 26th, 1923, for the Construction of Pavements:-

Concrete 2,000 sq. yds.

Asphalt 10,000 Sq. yds.

Plans and specifications may be seen, and Form of Tender obtained at the City Engineer's office, on and after March 15th.

The lowest or any tender not necessarily accepted.

STANLEY SHUPE,
11 City Engineer.

OPEN FOR POSITION as foreman or superintendent, 20 years experience concrete bridge and culvert, pile driving, coffer dam work. References if necessary. Will go anywhere. Box 495, Burlington, Ont. 10-12

POSITION WANTED—Civil Engineering graduate, (Structural) with experience covering drafting, instrument-man, inspection, cost and timekeeping, desires opening with engineering or contracting concern. Excellent references. Box 166, Contract Record, Toronto. 10-11

GENERAL CONSTRUCTION SUPERINTENDENT with 25 years experience handling all classes of Buildings. Practical also Registered Professional Civil Engineer, wants position. A1 references. Will go anywhere. Box 175, Contract Record, Toronto. 11-14

WANTED SUPERINTENDENT for Asphalt Paving work. Must be capable of taking full charge and be fully experienced in all branches of the work. None but experienced men need apply. Highest salary for capable man. State age and references. Apply, Dufferin Construction Co. Ltd., 210 Victoria St., Toronto, Ontario. 10-11

New Ford Railway

Construction of a $6,000,000 railroad for freight carrying purposes only to operate between Duluth, Minn., and Superior, Wis., and the Twin Cities, is contemplated by Henry Ford, it is reported. The road is is said would be part of Ford's plans in connection with his proposed industrial plant at the high dam here in event that he is granted use of the power derived from the dam.

Hotel Building Active

New hotels in Spain are being started all the time, while several hundred buildings have been destroyed and modern new ones have been erected in their places. The construction of these buildings is let to contractors, who furnish the hardware for the houses. It is said that practically none of these contractors import on their own account, but purchase their hardware and sanitary equipment from firms in Spain. Much more might be gained by getting directly in touch with these firms than in attempting to secure orders from the prospective managers or owners of these hotels, since the contracts for the buildings include household hardware.

Bridge Building in Afghanistan

Sudden floods that swell the Kabul River and its tributaries temporarily isolate the large town of Jelalabad in eastern Afghanistan from the neighboring villages, on which it is dependent for its supplies of fresh food. The river has taken heavy annual toll in men and cattle drowned while attempting to cross the ford on the swollen stream in flood time. Afgan interests in economic betterment has been strongly roused by the young Amir, and has voiced sudden and powerful demand for bridge building. The towns of Kabul and Jelalabad, the two centres of population in the country, have united in a demand for Construction of two bridges across the Kabul River under Government contract. The project is said to be without great engineering difficulty in construction.

Electrification of Argentine Railway

An increase amounting to 1,500,000 gold pesos over the sum already allotted is provided by a proposed law recently submitted to the Argentine Congress, to be used for the electrification of the Argentine Transandine Railway between Zanjon and the Chilean frontier. A contract between the Government and the Argentine Transandine Railway Co. has already been approved under the provisions of the law of October 13, 1921. This agreement provides for joint administration of the Chilean and Argentine Transandine roads, connecting Mendoza and Los Andes. It stipulates that the Government shall place at the disposition of the railway company bonds of the Argentine external loan, not to exceed 2,500,000 gold pesos, bearing interest at the rate of 5 per cent per annum, with 1 per cent amortization.

The new line, for which the additional 1,500,000 pesos has been requested, is approximately 45 kilometers in length and connects with the section of the Chilean line, which is also to be electrified.

forth Ave., awarded to Bourne & Harris, 259 Leslie St.

Power Plants Electricity and Telephones

CONTRACTS AWARDED

Lake St. John, Que.
The contract for hydraulic power machinery for Saguenay dam has been awarded by the Quebec Development Co. to Canadian Allis Chalmers at $1,500,000.

Megantic, Que.
All hydraulic, electrical machinery and appartus for the Hydro electric plant at Megantic supplied by Wm. Kennedy & Sons Ltd., Owen Sound, Ont.

Miscellaneous

Brantford, Ont.
Cameron & Ralston, Barrett Building, architects preparing plans for the proposed $125,000 Mausoleum for the City.

Montreal, Que.
Letters patent have been granted incorporating the National Cement Company, Montreal, with a capital stock of $4,000,000. This company will manufacture Portland cement, artificial stone, or other articles wholly or partially composed of Portland cement.

Oliver, B. C.
Tenders are wanted by the Provincial Government for a supply of metal fluming. T. D. Patullo, Minister of Lands.

Toronto, Ont.
Ramsay & McIntosh, recently with Edges Ltd., have opened an office at 114 Jarvis St. and will conduct a plumbing and heating business.

CONTRACTS AWARDED

Ottawa, Ont.
City has awarded additional contracts for supplies as follows: Sand, B. H. Dowler, Ottawa and R. R. Foster, Canal Basin, Ottawa. Concrete sewer pipe, Independent Concrete Pipe Co., Toronto; pig lead, Kingston Smelting & Mfg. Co., Montreal; valves, Canadian Fairbanks Morse Co. Ltd., Ottawa; lead pipe, Crane Ltd., Ottawa.

Toronto, Ont.
City has awarded the contract for a travelling crane to John T. Hepburn Ltd., 18 Van Horne St., at $1,975.

Fires

Beauceville, Que.
Theodore Poulin's residence, recently destroyed by fire at a loss of $15,000, will be re-built.

Freeman, Ont.
Ed. Sherwood will rebuild barn and outbuildings destroyed by fire at a loss of $10,000.

Montreal, Que.
$60,000 damage to the Central Garage Ltd., 260 Pine Ave., by fire. Emile Parrot, 249 Laval Ave., manager. Owners will re-build.

Penetanguishene, Ont.
Buildings owned by the Adams Shoe Co. was damaged by fire to the extent of $7,000. Owners will re-build.

Point Edward, Ont.
Cement plant owned by Walter Reid, Sarnia, destroyed by fire at a loss of $20,000 will be re-built.

Riverside, N. B.
Store owned by W. J. Carnworth gutted by fire with loss to building of $18,000.

Late News

Birchcliffe, Ont.
Council contemplates building a fire

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for Contractors, for Public Highways, Contracts and all Municipal and private Corporation work.

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·BULLETIN №·9

·BURLINGTON·STEEL·Co·LTD·

RAIL CARBON

REAL STRENGTH

·HAMILTON·ONT·

·THE·MOTHER·RAIL·

THE BIRTH OF A RAIL IS A SERIOUS MATTER. THE WHOLE PROCESS IS SUBJECT TO THE MOST CRITICAL INSPECTION, AND SUBJECT ALSO TO A MOST RIGID INSPECTION.

IN STANDARD RAIL SPECIFICATIONS YOU WILL FIND THE FOLLOWING: "SUFFICIENT DISCARD MATERIAL TO INSURE SOUND STEEL SHALL BE DISCARDED FROM THE END OF THE BLOOM FORMED, AND FROM THE TOP OF THE INGOT. TO INSURE SOUND RAILS, DISCARD A SUFFICIENT LENGTH OF THEIR CROP ENDS."

FOR THE LAST DECADE ALL RAILS HAVE BEEN MANUFACTURED UNDER THE FOLLOWING CONDITIONS:

THE PURCHASERS' INSPECTOR SUPERVISES :—

THE CHARGING OF THE FURNACE.

THE POURING OF THE INGOT.

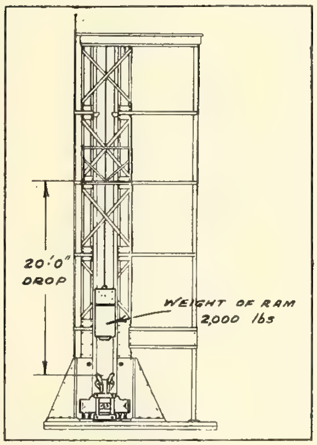
THE COOLING OF THE INGOT.

THE DISCARD FROM THE INGOT.

THE ANALYSIS OF THE INGOT.

THE ROLLING OF THE BLOOM.

THE TOP AND BOTTOM DISCARD FROM THE BLOOM.



"THE DROP TEST ON THE RAIL."

THE ROLLING OF THE RAIL.

THE DISCARD FROM THE RAIL.

THE DROP TEST ON THE RAIL. (2,000 LBS. DROPPED THROUGH 20 FEET.)

THE NICK AND BREAK TEST. (THE RAIL BEING BROKEN THROUGH AND EXAMINED FOR DEFECT.)

THE MARKING AND SHIPPING OF THE RAIL

WHAT OTHER COMMERCIAL STEEL GOES THROUGH SUCH A GRUELLING?

AND ALL WE DO IS TO CONTINUE THE ROLLING TO THE SIZE YOU REQUIRE IN YOUR STRUCTURE, AND THE RESULT IS THE RAIL-CARBON BAR, EMBLEMATIC OF STRENGTH AND PURITY.

SPECIFY YOUR REINFORCEMENT TO COMPLY WITH THE AMERICAN SOCIETY OF TESTING MATERIALS STANDARD SPECIFICATION A-16-14.

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of Canada, Limited
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Sturtevant
PUTS AIR TO WORK

tation costing $25,000. Chief Mr. Walsh.

Grimsby, Ont.
Wm. Chivers contemplates a store costing $15,000. All trades to be let.

Hamilton, Ont.
At a cost of $20,000 Doolittle-Russell Ltd., will convert the Peoples' Brewery property into a builders supply yard C. M. Doolittle, James St., Mountai Top, interested.

Montreal, Que.
Tenders are being received until Apri 3 by the Harbor Commission for the proposed grain elevator costing $2,500,000.

Plans are being prepared for an apartment house containing 250 suites. Ross & MacDonald, 1 Belmont St., architects. P. DuTremblay, c/o La Presse, St. James St., interested.

Plessisville, Que.
Municipal council contemplates a Town Hall costing $15,000. L. R. Guilbault, secretary-treasurer.

Toronto, Ont.
Canada Life Assurance Co., Canada Life Bldg., contemplate a building at the corner of Gerrard and Yonge Sts. Sproatt & Rolph, 36 North St., architects. W. R. Dunlop, 42 King St. W., Building Superintendent.

Cathedral Menaced

Heavy traffic in the surrounding streets is threatening the famous spire of Salisbury Cathedral, the tallest in England. For 600 years the spire has reared its height of 404 feet out of the green valley of the Avon without visible signs of deterioration.

Engineers recently found, however, that it leaned 23 inches from the perpendicular. Vibrations from heavy motor traffic are believed to have caused this, and it will be necessary at once to begin the work of straightening the foundation.

A police order has been issued prohibiting heavy truckage in the immediate vicinity of the church.

Spiral Chimney

A British aeroplane engineer has built a spiral chimney in such a way that is presents a corner to winds from any direction. This is an attempt to solve the engineering problem of build in tall chimneys to withstand the tremendous pressure of winds at high velocity.

Each brick at the corners is displaced one sixteenth of an inch, so that the chimney forms a spiral. As a reult, each corner at the top of the stack is directly above the middle of one side of the base. Thus, the thrust of a wind is distributed over two sides of the chimney, instead of being concentrated on one side, and thin walls will withstand a wind pressure that might demolish the chimney if the sides were flat. A spiral chimney can be built without added expense.

No We're Not Ready To Go Into That Yet Mr. Smith —

These Useless Trips Mean Wasted Money

HOW WE JUMPED SALES 50 PER CENT

A Fact-Story in Which a Successful Sales Executive Points Out, One by One, the Steps He Took to Locate Leaks, Stop Waste and Increase the Productivity of His Sales-Force.

The surprising thing is that it did not occur to us long ago to make this change.

What change, you ask? But thereby hangs a tale.

In our line of business our biggest single item of expense is that for selling. Month by month the total of our sales expense column had been growing until it threatened finally altogether to submerge that other column, headed "Sales."

So it was up to me as Sales Manager to do something drastic before the matter was definitely brought to the attention of the Managing Director, in the form of red ink figures in our monthly balance sheet.

How was I to cut down sales expenses without at the same time reducing sales? Or how was I to build up sales without adding to our sales expense?

I went at the problem in analytical fashion. I began to collect reports, facts and figures. I found the average number of calls per day for all our men. I found the average number of calls for each man. I divided their total individual monthly sales by the calls made and thus got the amount of sales per call. Very soon I began to realize that the amount sold per call was pitifully small.

So I went into the individual salesman's reports and noted that their statements seemed almost automatically to fall into certain classes. One very common class was that which I might describe as "dead calls." By that, I mean calls which brought no results: such for instance as where the salesman was merely trying to get information as to dates of tenders and names of contractors but had no definite follow up idea in mind. Perhaps the most tragic thing of all was the large number of salesmen's reports, which bore the statement "not ready yet," and which mentioned no date upon which to call back.

Now what was the use, I asked myself, of having salesmen bother busy executives at a time when they were not prepared to consider the particular business concerning which information was sought. What we definitely needed, was a system by which our salesmen would concentrate their energies on genuine prospects, and by which their visits would be properly timed to catch the man in authority at the psychological moment when he was ready to go ahead with some project.

So I began to cast about for such a source of information. Various friends and business associates had at one time or another mentioned to me the MacLean Building Reports, but I had always dismissed the idea of using the latter, in the belief that we, for one company, were adequately equipped without them.

Two months trial of the MacLean Service proved how mistaken we had been. With the aid of the timely information which it afforded us, we began to send out our men to the right places and at the right time. Within two months results began to flow. In the first place we were able to lop off many surplus items of expense. Then, too, it put pep into the sales-force. They began to see that there really was business to be had and that they could get it under our new method. Consequently volume moved steadily upward from the beginning of the second month.

Thus, it was by a very simple plan,—that of getting correct verified information in advance, on all movements in the building trade, we were able to double our sales in less than a year—and thus did we once and for all put that "Sales" column so far ahead of the "Sales Expense" column that the latter will never catch up.

To-day we feel that we could not successfully do business without these reports. Our whole sales-effort, both advertising and personal solicitation, which we link together, is based on this information. It has paid us in a big way, solved for us a problem that we ourselves could not have solved without this aid.

Getting Sales Facts First

You, too, may secure sales information FIRST through using MacLean Building Reports in your business. Our new booklet "Getting Sales Facts First" explains our remarkable system in detail. We invite you to send for a copy. It gives all the facts. Sending for it has been the first step toward larger profits on the part of many hundreds, including the firm whose story is told on this page. A copy is waiting for you.

MacLean Building Reports, Ltd.

345 Adelaide Street W., Toronto
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Send me "Getting Sales Facts First," which I may keep without obligation.

Name ....
Print here

Firm ....

Business Address ....

What territory do you cover? ....

Current Prices of Building and Engineering Materials

		Toronto	Montreal	Winnipeg	Vancouver
CEMENT (Delivered on job):—					
Retail lots including bags	per bbl.	$4.60	$4.16	$4.80	$3.70
Car lots, including bags	per bbl.	3.60	3.48	4.16	3.35
Refund on bags	each	.20	.20	.20	
LIME (Delivered on job):—					
Lump, in retail lots	per ton	14.30	14.00	.58 bu.	2.70 bbl
Lump, in car lots	per ton	12.70**	11.00	13.80 ton*	2.60 bbl
Hydrated, in retail lots	per ton	20.00	26.00	.60 bag*	30.00
Hydrated, in car lots	per ton	19.00	21.00	.54 bag*†	25.00
BRICK and TILE (Delivered on job):—					
Common face brick	per M.	24.00	16.50*	19.00	30.00
No. 1 dry pressed brick	per M.	31.00	30.00	36.00	70.00
No. 2 dry pressed brick	per M.	29.00	25.00	32.00	
Enamelled brick	per M.	125 up to	230.00	185.00	150.00
Wire cut brick, for foundation work	per M.	21.00	19.00		50.00
Sand lime brick	per M	17.00		18.00	
Hollow building tile	per M.			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	60-95	60-75	85-100	80.00
Fire clay	per ton	13-20	15-16.00	35.00**	22.00
STONE, SAND and GRAVEL (f.o.b. cars on siding):—					
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.00 yd.
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 "	" "
Crusher run	per ton	2.20½		3.00 "	" "
Rubble stone	per ton	2.45	1.70	15.00 cord	" "
Gravel, 2 in. screened	per ton	2.05		2.45 yd.	" "
Gravel 1 in. screened	per ton	2.31	1.50	2.75 "	" "
Sand, screened	per ton	1.42½	1.25	1.90 "	" "
Pit run	per ton	1.52¾	1.25	1.90 "	" "
STEEL and IRON (f.o.b. warehouse):—					
Mild steel bars, ¼ in. and heavier	per 100 lbs.	3.25 base	3.50 base	4.35	$4.00
Bands 3/16 in. and lighter	per 100 lbs.	3.75 "	3.50 "	4.85 base	
Hoops	per 100 lbs.	4.50 "	4.50 "		
Twisted and deformed bars	per 100 lbs.	3.35 "	3.50 "	4.20	4.00
Angles, channels and tees under 3 in.	per 100 lbs.	3.35 "	3.75 "	4.95	6.00
Structural shapes	per 100 lbs.	3.60 "	3.75 "	4.75	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.25 "	3.60 "	4.75	6.25
Plates—3/16 in.	per 100 lbs.	3.60 "	3.95 "	5.15	6.50
Plates—10 gauge	per 100 lbs.	4.15 "	4.25 "	5.45	6.50
Black sheets—28 gauge	per 100 lbs.	5.00 "	4.90 "	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.20 "	7.00 "	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	6.20 "	6.50 "	7.70	8.25-8.50
Rivets	per 100 lbs.	5.75 "	5.50 "	7.00 base	
Cast iron pipe	per ton	60.00	55.00		
VITRIFIED CLAY PRODUCTS (Delivered on job):—					
Sewer pipe, 4 in.	per ft.	.40	.30	.35	.38
Sewer pipe, 6 in	per ft.	.60	.45	.45	.48
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.55
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.70
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.85
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00	.90	.65	.75
Chimney tops	each	9.00	3.50–5.00	7.50	4.50–6.00
Discounts		45 % truck lots 50 % car lots	20 % 50 %	5 %	

CEMENT:—*Discount of 10 cts. per bbl. in 20 days. Price f.o.b. cars is $3.75 †Subject to 5% discount. **Excluding bags.
LIME:—*Discount of 5%. †Bag of 50 lbs. **Price f.o.b. cars is $11.70.
BRICK AND TILE—*f.o.b. plant.
STONE SAND AND GRAVEL:—*Winnipeg prices subject to 5% disco **Toronto prices include sales tax.

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THE Insley Mast-Hoist Bucket Plant

For the small job or the limited space

Only one mast to erect

A handy, efficient piece of equipment, which soon pays for itself.

INSLEY CONCRETE CHUTING PLANTS SMITH MIXERS, MARSH HOISTS

Bucyrus Shovels, Western Cars, Vulcan Locomotives, Barber-Greene Portable Belt Conveyors and Bucket Loaders Byers Cranes, Derricks, Wire Rope

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MUSSENS LIMITED

Montreal Toronto Winnipeg Vancouver

CURRENT PRICES OF BUILDING AND ENGINEERING MATERIALS— continued

Lumber (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver*
Flooring, 1 x 3 and 4 in., clear, E. G. fir	per M.	90,00	60.00	84.00	55.00
Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	70.00	65.00	56.00	30.00
Flooring, No. 1 pine	per M.	70.00	80.00	64.80	
Flooring, No. 1 Spruce	per M.	48.00	40.00	39.60	
Flooring, birch and maple, 13/16 in. clear	per M.	130.00	110.00	152.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	130.00	125.00	140.00	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	70.00	60.00	56.00	30.00
V joint, No. 1 pine	per M.	70.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	43–58	45.00	63.75	
Red and Jack Pine, 2 x 4 to 12 in., com. rough	per M.	44/58	70.00	36.00	
Hemlock, 2 x 4 to 12 in.	per M.	40/44	40.00	36.00	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	40–50.00	50.00	36.00	11.00-13.50
Spruce, 1 and 2 x 4 to 12 in.	per M.	44/58	45-35	36.00	
Timbers, fir, 10 x 10 in. and up	per M.	63.00	58.00	47.00 base	17.-22.00
Lath, No. 1 white pine	per M.	16.00	12.00	12.00	
Lath, M. R. spruce	per M.	10.00	8.50	10.00	7.00
Shingles, XXX B.C. cedar	per M.	6.50	5.00	5.25	3.40
XX B.C. cedar	per M.	5.00	4.25	3.75	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	108.00	55.00
Fir casing	per M.	1 ct. per in.	100.00	108.00	

PAINTS, OILS, COLOURS (delivered):—		Toronto	Montreal	Winnipeg	Vancouver*
White lead ground in oil, less than ton lots	per cwt.	14.55	13.75	14.85	15.80
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	22.00
Putty in bulk	per cwt.	5.45	4.25	5.50	9.25
Steel sash putty in bulk	per cwt.	5.95	6.00	8.75	7.75
Boiled linseed oil, in bbls.	per gal.	1.20	1.17	1.13	1.28
Raw linseed oil, in bbls.	per gal.	1.23	1.15	1.10	1.25
Turpentine, in bbls.	per gal.	2.20	2.10	2.15	1.60
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 4/5	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 1/5	.45

PLASTER (Delivered):—		Toronto	Montreal	Winnipeg	Vancouver*
Hard wall plaster, sanded	per ton	13.50	15.00	25.00	30.00
Plaster of paris, in bbl. lots	per bbl.	6.00	5.35	1.60 bag*	7.50
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu.	1.50

LABOR:—		Toronto	Montreal	Winnipeg	Vancouver*
Bricklayers	per hr.	1.00	.80–.90	1.15	1.06¼
Structural Iron Workers	per hr.	.85	.50–.75	1.25	1.00
Plasterers	per hr.	1.00	.80	1.05	1.06¼
Hoisting Engineers	per hr.	.70–.80	.50	.90–1.10	1.00
Plumbers	per hr.	.90	.60–.75	1.00	.90
Carpenters	per hr.	.80	.65	.90	.81¼
Painters	per hr.	.75	.55–.65	.80	.81¼
Electrical Workers	per hr.	.80	.65	.70– .90	1.00
Roofers	per hr.	.65	.65		.90
Laborers	per hr.	.40–.50	.30	47½–.55	.50–.56¼
Sheet Metal Workers	per hr.	.75			.90

LUMBER:—*Owing to the general unstable condition of the present lumber market, Vancouver dealers refuse to quote any prices at all especially for Prairie or Eastern publication. The prices are, moreover, fluctuating from day to day. Such prices as we quote are, therefore, averages and not standard.

PLASTER *Including bags.

SCREEN GRAVEL
PEA GRAVEL
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Rapid Truck Delivery. Just Phone
Beach 1128 or 1780

ALLEN BROTHERS
STOP 19, KINGSTON ROAD
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Keystone Hair Insulator

—an investment in comfort that brings a return in economy

"IT'S such a comfortable house and so easy to heat" —that's the house with Keystone Hair Insulator built into its walls, floors, ceilings and roof.

An investment in comfort, yes—but an investment that eventually costs nothing, for Keystone will quickly pay for itself in the coal it saves.

The protecting blanket of Keystone keeps the heat in the house in Winter bringing comfort and saving coal. In Summer, Keystone keeps the heat out making the house cooler—and, again, more comfortable.

Tenants like to live in buildings insulated with Keystone. An "easy to heat" building adds to an architect's or builder's reputation. Any building worth living or working in is worth insulating with the best material obtainable.

Keystone is the highest grade material of its kind. It will not split, rot, pack down, carry flame nor lose its efficiency.

Keystone is also an excellent sound deadener for floors and partitions.

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COVERS THE CONTINENT
Through
Asbestos
and its allied products
INSULATION
BRAKE LININGS
ROOFINGS
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CEMENTS
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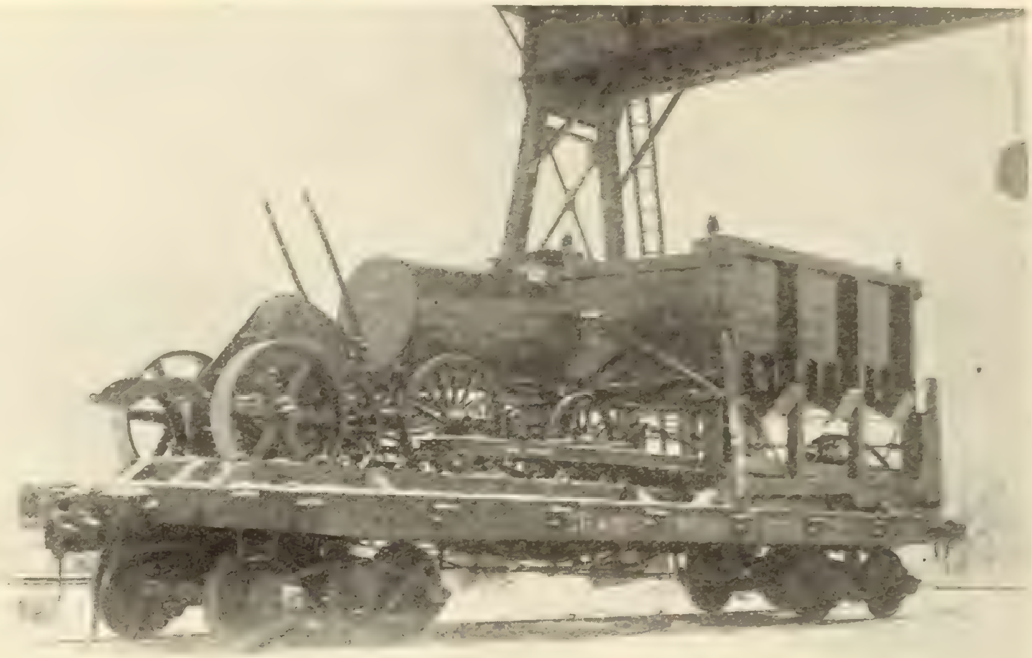
JOHNS-MANVILLE
Building Materials

THE DOMINION ROAD MACHINERY CO., Limited
GODERICH - ONTARIO

GRADERS



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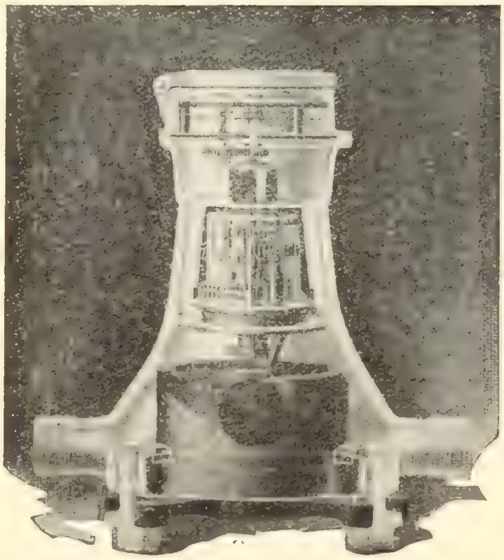
One township's order for our equipment

Write for our catalogue and prices on road and street building machinery



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PIONEER METERS

Neptune meters are the pioneer water meters in Canada. They represent the result of years of steady development. Neptune meters have introduced every great improvement in meter design and construction. The last—the Trident Oil Enclosed Gear Train—is the greatest of all. You should know about it.

Full information will be gladly furnished on request

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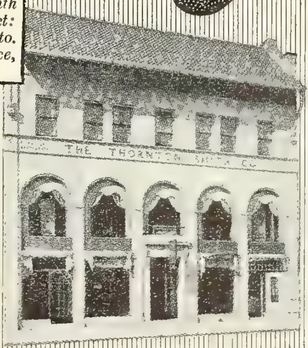

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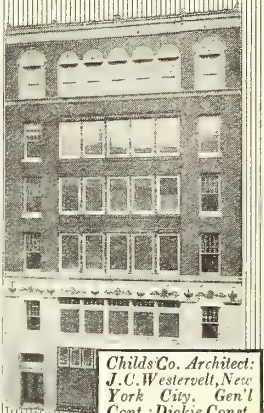

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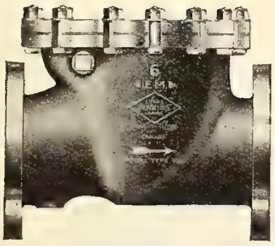

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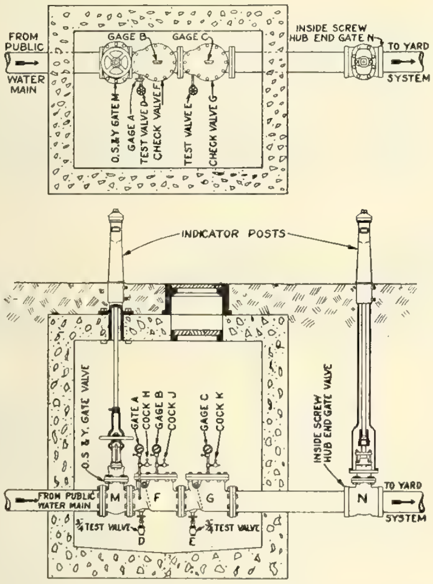

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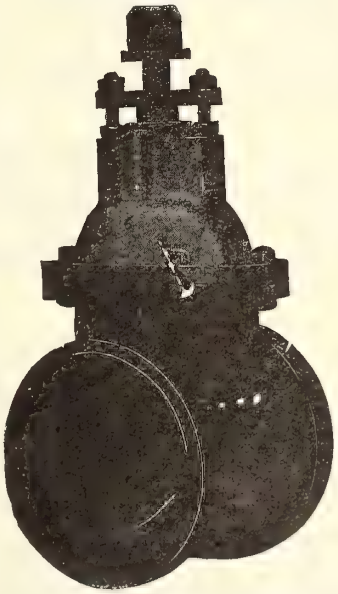

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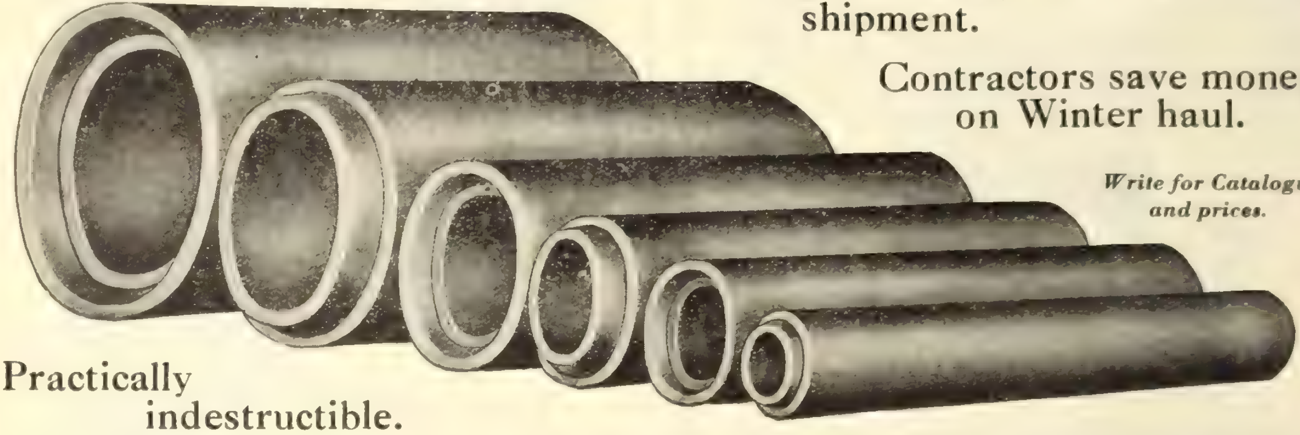

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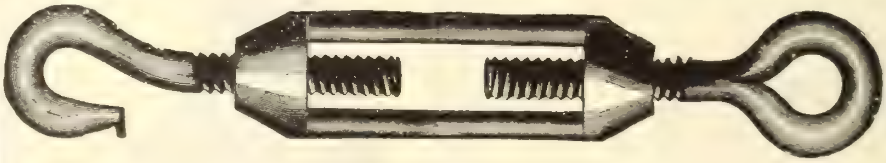

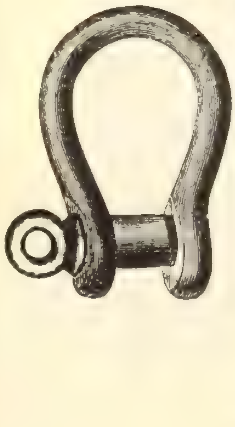

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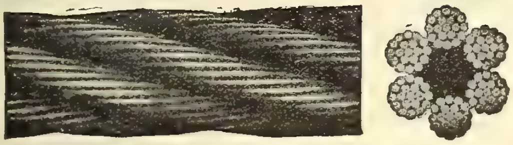

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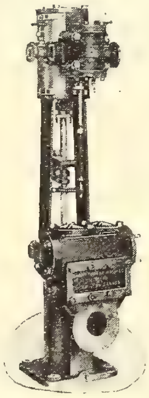

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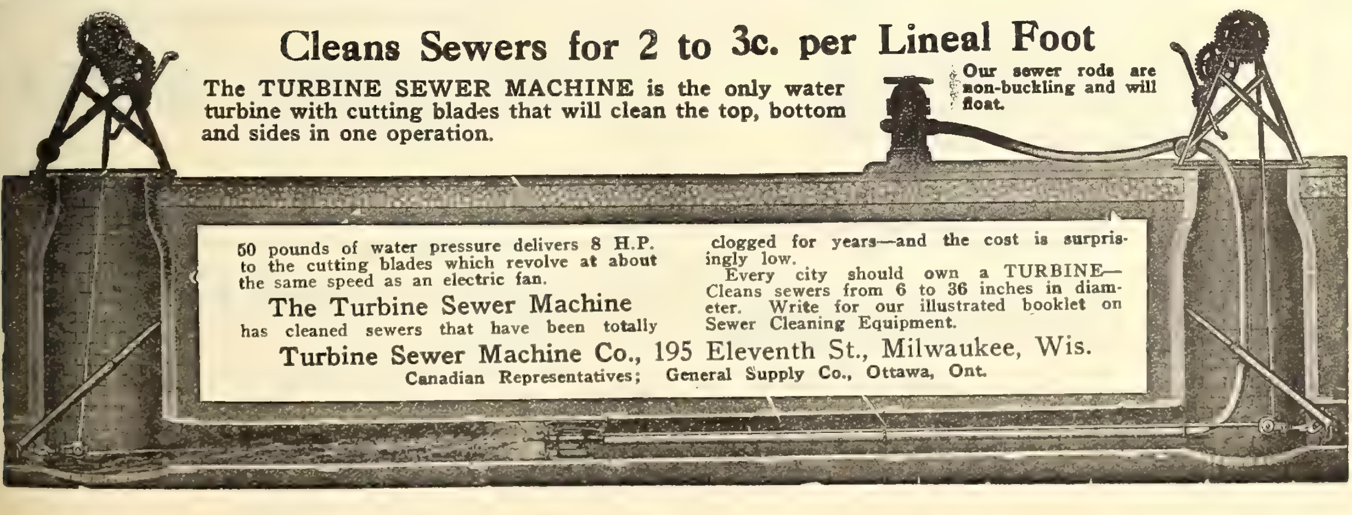

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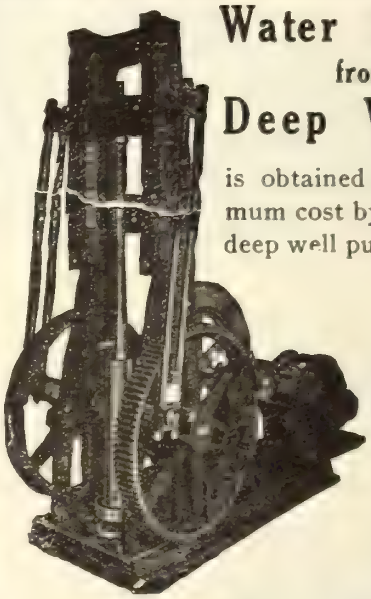

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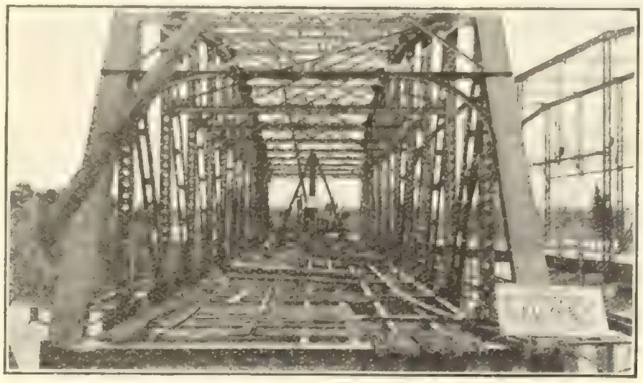

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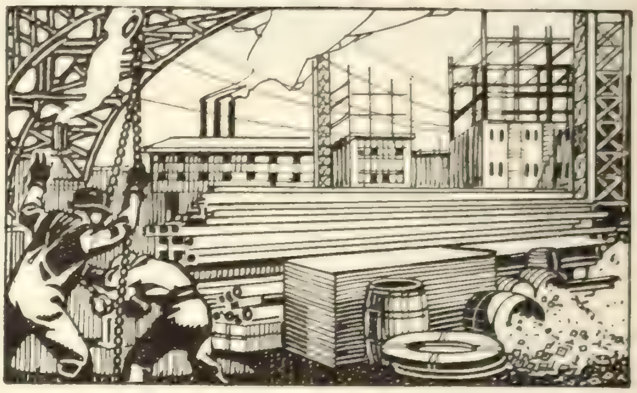

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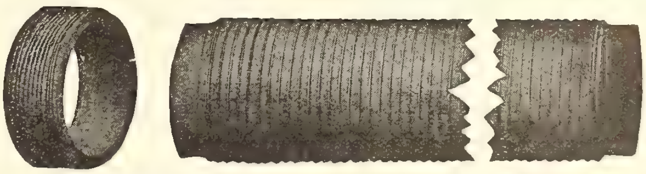

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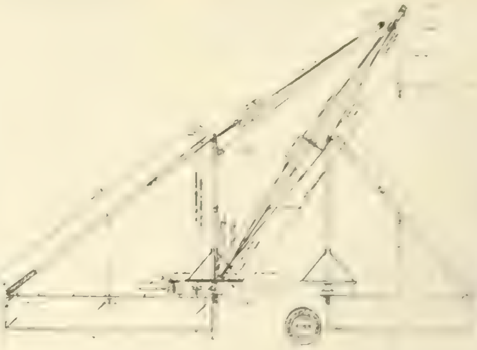

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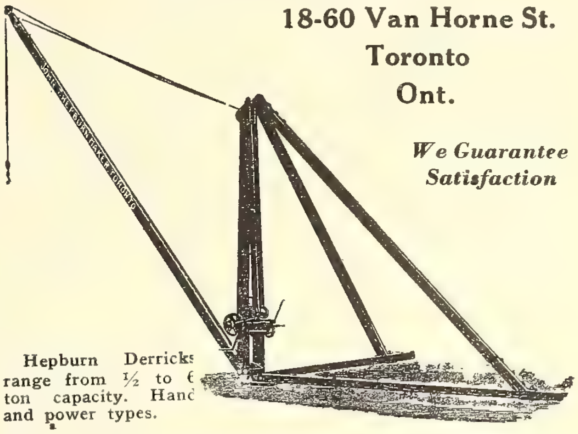

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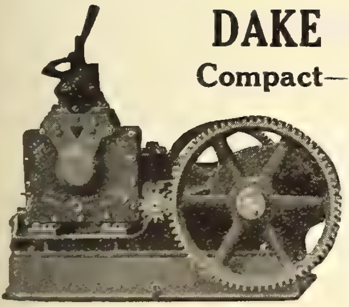

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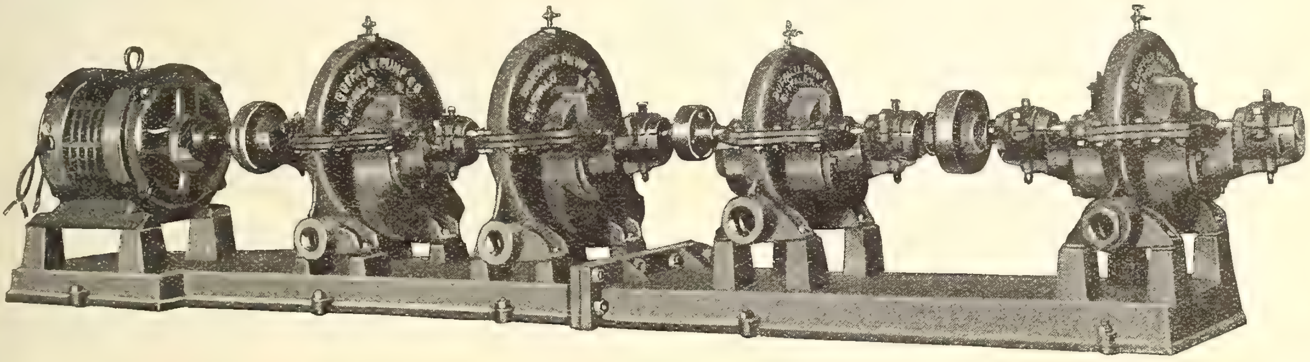

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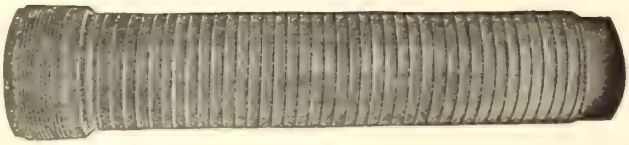

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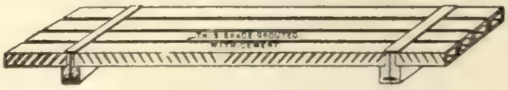

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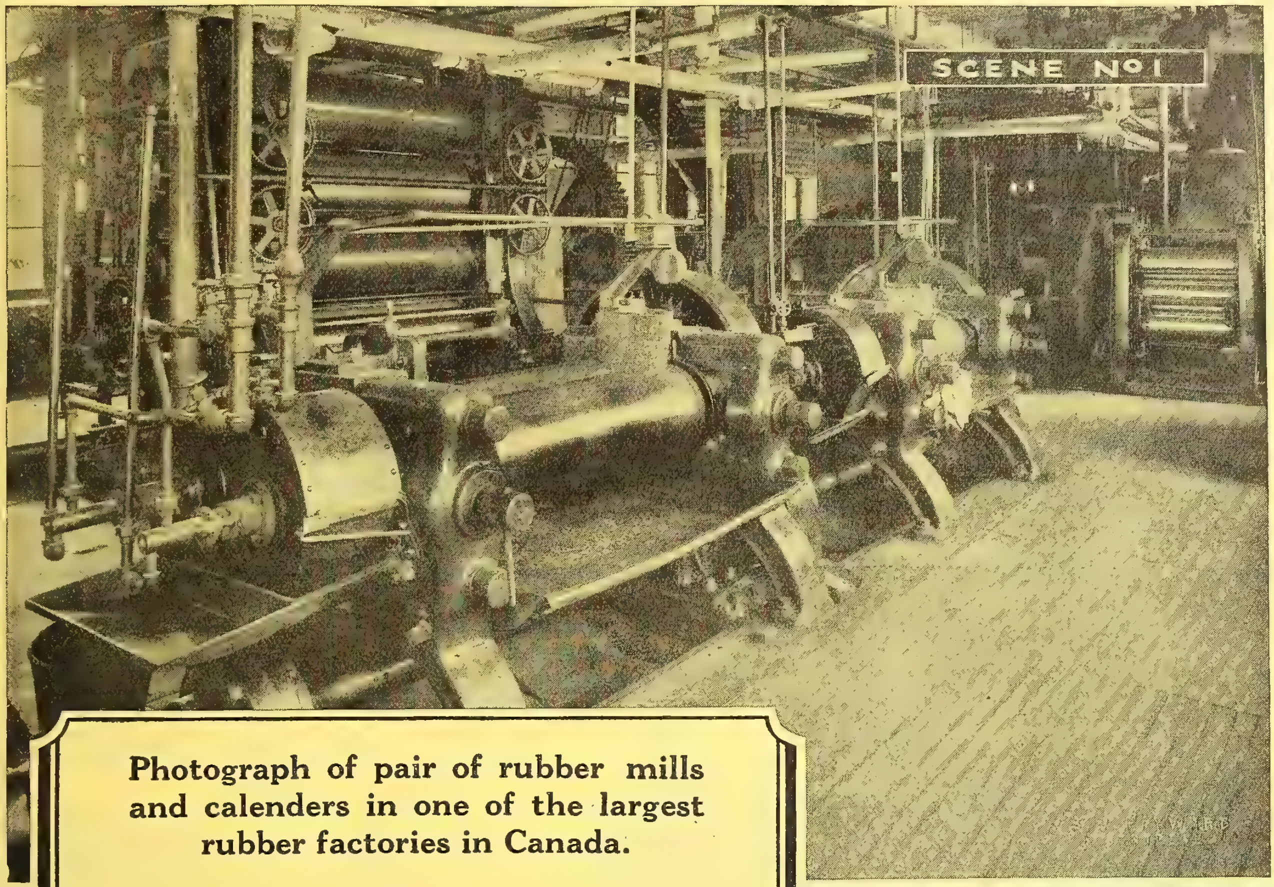

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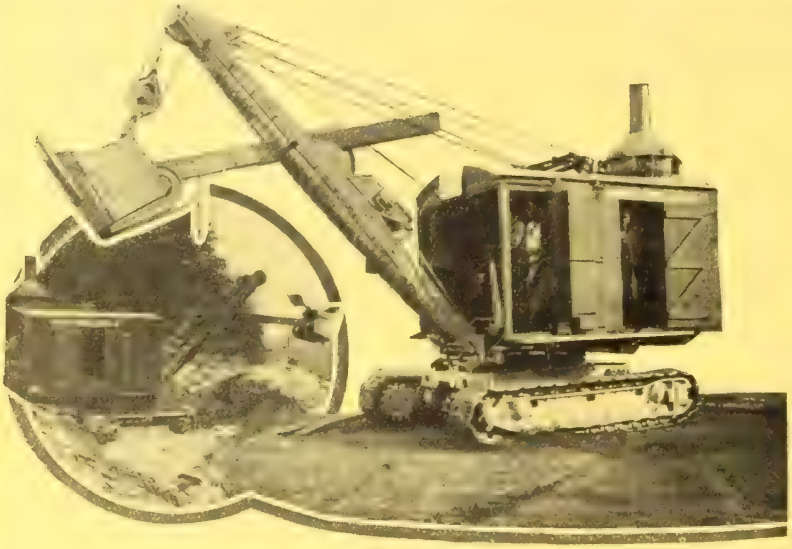

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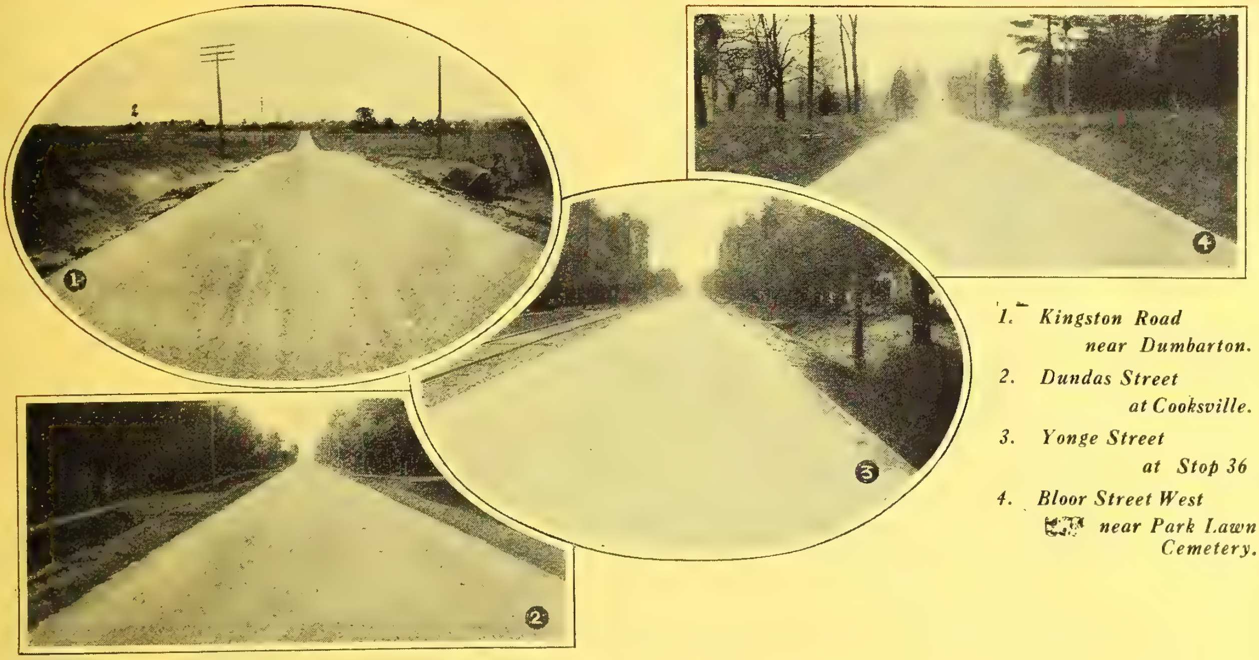
Vol. 37 Toronto, March 21, 1923 No. 12

Contract Record and Engineering Review



1. *Kingston Road near Dumbarton.*
2. *Dundas Street at Cooksville.*
3. *Yonge Street at Stop 36*
4. *Bloor Street West near Park Lawn Cemetery.*

Asphalt—Entering Toronto

The development of the Provincial Highway System reached an important stage last year when connecting links of Asphalt were completed at the Toronto end of three important highways into the city from the west, north and east.

Contracts for 3" Asphalt pavements (1½" Asphalt Binder, 1½" Sheet Asphalt) over concrete or macadam, as specified in the respective contracts, were awarded to (1) Merlo, Merlo and Ray, Limited (2) Kilmer and Barber, Limited (3) Warren Bituminous Paving Company, Limited (4) Constructing and Paving Company, Limited, the numbers referring to the illustrations and legend above.

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Completion of these sections marks a new era in transportation facilities around Toronto. Not only will these highways serve important areas where better roads have long been needed but will bring Toronto into closer touch with the surrounding country.

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Paving Asphalts
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Liquid Asphalts
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Alphabetical Index to Advertisers Page 16 Classified Directory to Advertisements Page 6

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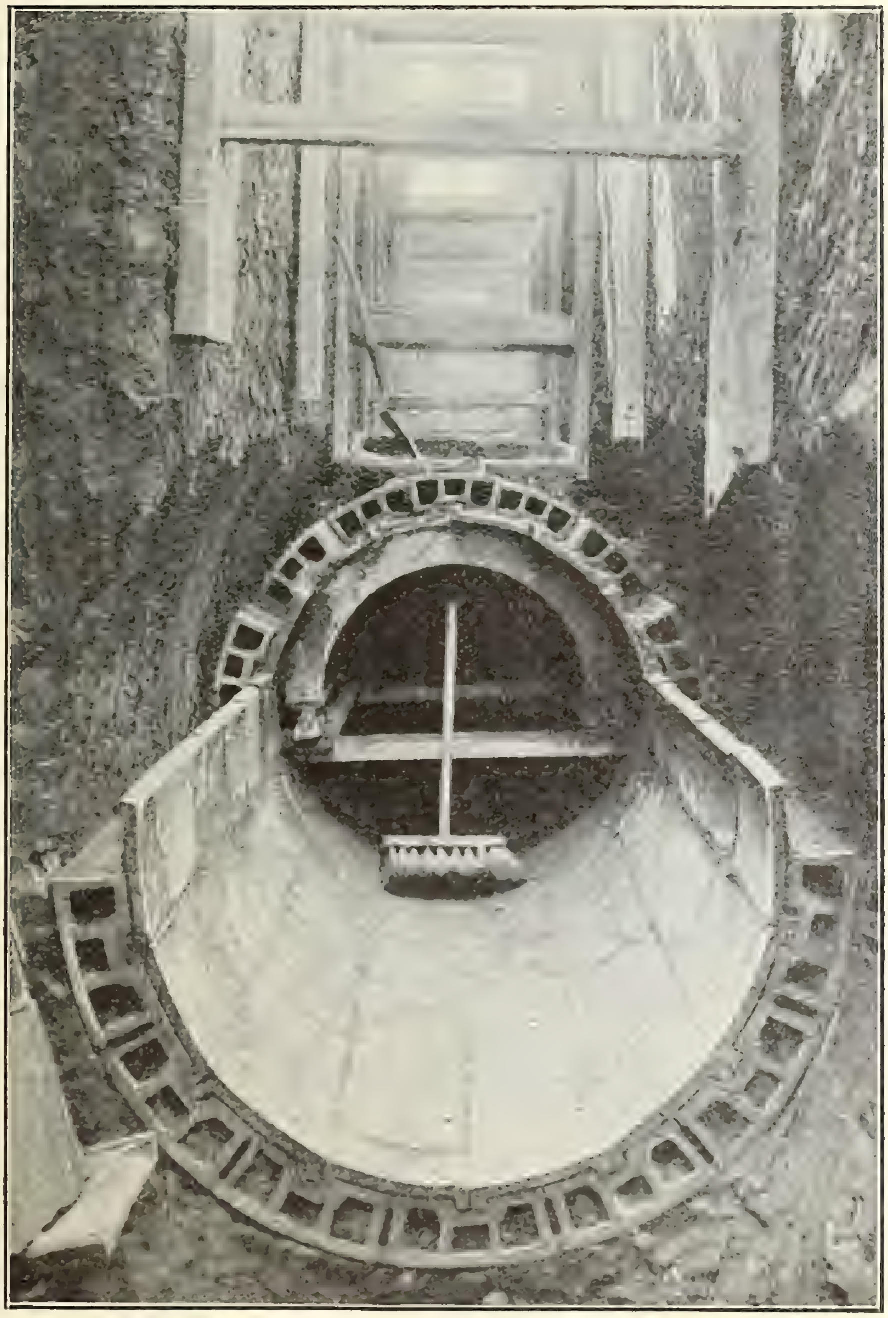

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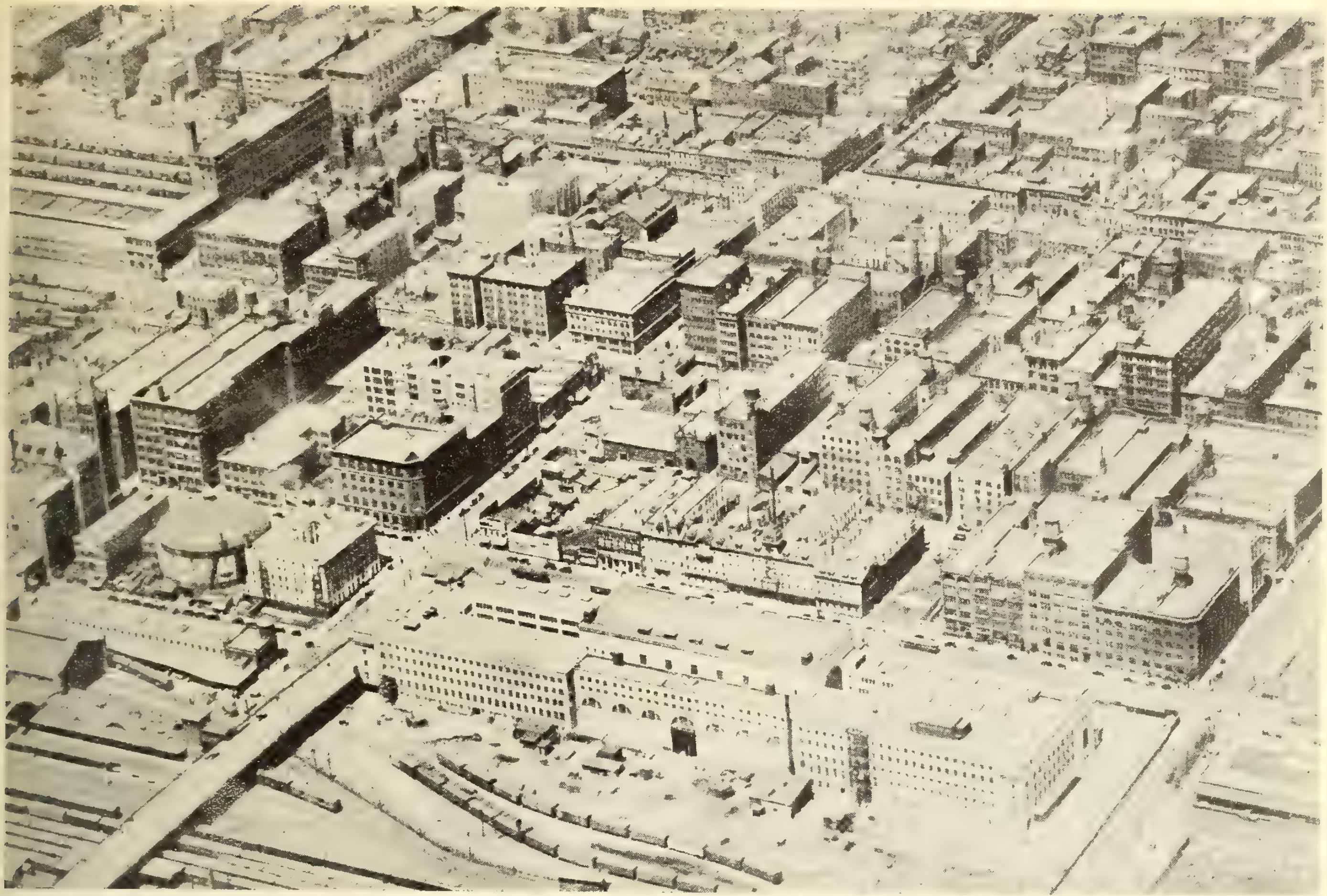

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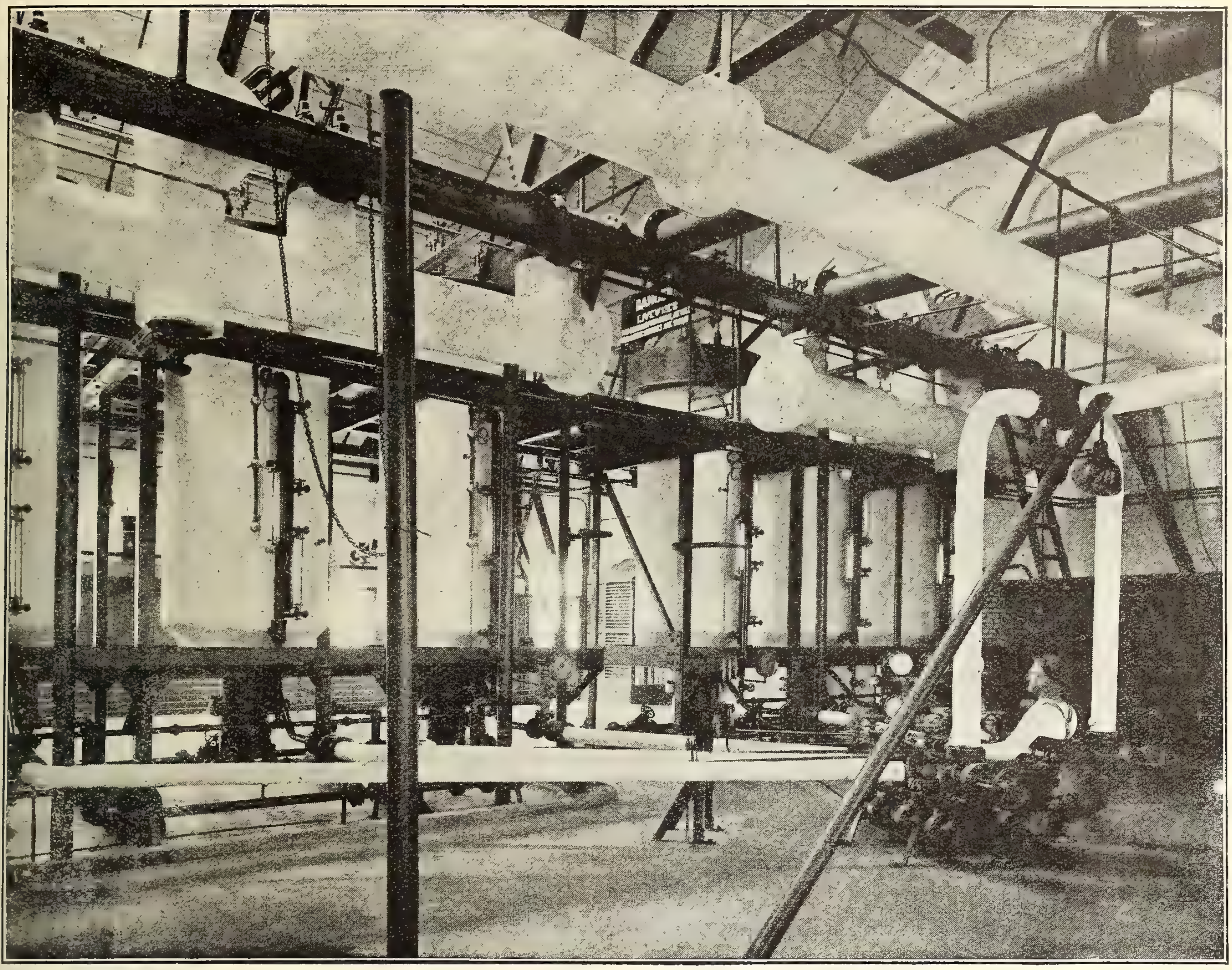

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Queenston Quarries Co.

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Extract from Article in Contractors' Atlas

by C. H. Markham, President Illinois Central System.

For my part, however, I see nothing to indicate that there will be any material decrease in the volume of business for some time. We are in a period of busness activity. **There is at present a serious transportation shortage,** and if business conditions continue as promising as they are now the shortage will doubtless continue, for **it will be impossible for the railroads to afford material relief by spriing.**

However that may be, it would seem to me that it would be a prudent course for dealers, contractors and other consumers who will need building materials next spring and summer to stock up in advance, as they may have the opportunity, and not rely altogether upon the ability of the railroads to furnish the transportation necessary to move all their supplies promptly during the season when there is normally the heaviest demand for building materials and when, because of his urgent need for such materials in great quantities, the consumer naturally requires delivery with the utmost degrees of promptness.

This will be a big year for Heltzel Forms—bigger than any previous year this Company has enjoyed.

Important

A Serious Transportation Shortage

Order Your HELTZEL "Armour Plate" Steel Road Forms NOW

Big contractors in all parts of the country have already seen the handwriting on the wall and are ordering now their Heltzel Steel Road Forms for 1923.

Heltzel Steel Forms are preferred for many important reasons:

First, their capacity—just three parts: rails, pedestals and stakes.

Second, their greater strength and rigidity—made of open hearth steel 3/16" thick and with 6" base for broad bearing surface.

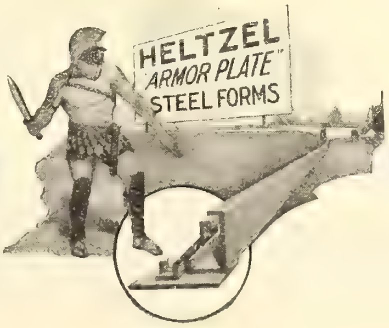
Third, they save time in setting and stripping—just run the line to grade, set the pedestals, hang the rails and drive the stakes.

Write today for Bulletin No. 34F, or better still, play safe and order your Heltzel Steel Road Forms today.

THE HELTZEL STEEL FORM & IRON COMPANY

Warren, Ohio

World's largest exclusive builders of steel forms for road, sidewalk, curb, curb and gutter and all types of concrete construction, also tamping machines, Heltzel Strike-off and Tamp, Heltzel Rotary Steel Float, and other accessories.



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(Continued on page 10)

The HAMILTON BRIDGE WORKS CO.,
LIMITED

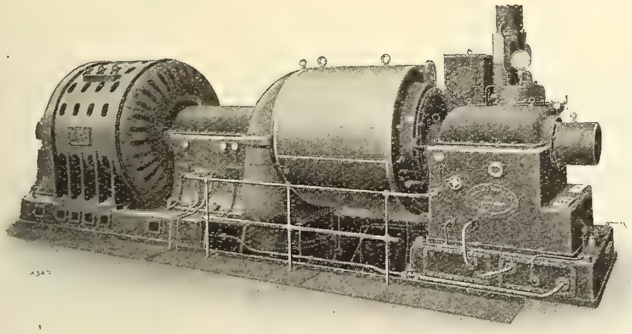
HEAD OFFICE
and WORKS
HAMILTON
Canada

STRUCTURAL STEEL
Engineers, Manufacturers
and Contractors

BRANCH OFFICE
410 General Assurance
Bldg.
Bay and Temperance Sts.
TORONTO

We carry a large stock of Structural Shapes and Plates and your requirements can be immediately filled. Our large shops, with a capacity of 36,000 tons annually enable us to turn out whatever you require, from the largest building to a few beams, in a surprisingly short time.

Steel Railway and Highway Bridges, Buildings, Girders, Crane Runways, Towers, Turntables, Trusses and Columns



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BELLISS & MORCOM LTD.
BIRMINGHAM ENGLAND

STEAM TURBINES
STEAM ENGINES
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operated by Oil Engines

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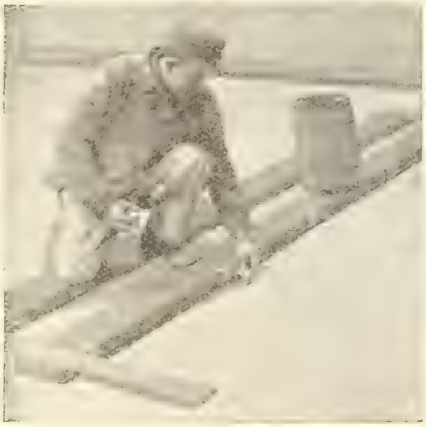
Agents—

LAURIE & LAMB, Board of Trade Bldg., MONTREAL

THE BULL-DOG

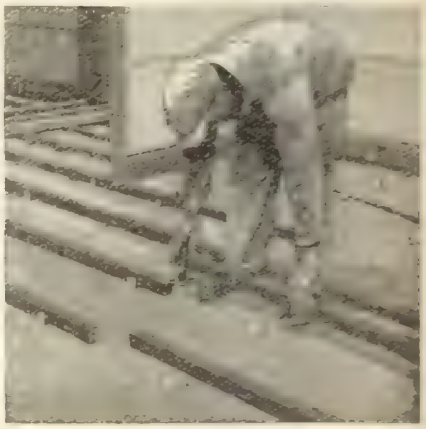
Modern Money Saving Simple Device

BULL DOG FLOOR CLIPS make it possible to secure the many important advantages of wood floors in reinforced concrete buildings at an economical cost, at a vital saving in time, and with a reduction of 18,000 lbs. dead load per 1,000 square feet. Better still, they assure a floor of lasting satisfaction. Concrete floor slabs are poured as in all concrete work, with screeds placed every 8 or 10 feet so that as the concrete is poured it can be leveled off with a straight-edge. With **Bull Dog Floor Clips,** no expensive fill, no cutting down high spots, and no delays, will be necessary. The simplicity of the six steps in installation is best demonstrated by the series of detail photographs below.



PLACING CLIPS.—When about 30 minutes after the concrete floor slab has been poured and leveled, the plank-guide is placed on the slab, and while the concrete is still green and soft, the clips are pushed into place, so that they embed with the flat top flush in the concrete, accurately spaced and in alignment. After the guide is made as described, no further measuring is necessary. The concrete worker is then entirely finished with his part of the job.

RAISING TABS.—After the concrete slab has hardened it can be used freely for walking, wheeling, or storage, as the flat tops of the clips offer no obstruction. When the job is ready for the wood floors to be laid, a workman goes along with a chisel, or a claw hammer, inserts the edge under the tabs and with a flip of the hand raises them perpendicularly. The solid one-piece clip of No. 20 gauge metal assures rigidity and ample strength.



PLACING STRIPS.—Nailing strips, measuring 1 13/16"x1⅝", the standard dressing of regular 2"x2" strips, are then placed along the rows of clips where they are held snugly between the raised tabs. Perfect alignment and spacing, 16" on centers in both directions, has been secured by the use of the plank-guides. The simplicity of placing strips with Bull Dog Floor Clips saves about 50% over the old fill-method and assures greater accuracy.

LEVELING-UP.—The level slab obtained by placing screeds before pouring, and the embedding of the clips so their tops are flush with the slab surface, assure an almost faultless base. Some leveling up across the nailing strips will be necessary, after which the strips are solidly nailed through the nail holes punched in each tab. Joints come within the clips. The firm anchorage to the slab obtained prevents buckling or doming, and eliminates squeaking when the floor is walked upon.

SLUSHING-IN.—This and the preceding step of leveling up, are in reality one operation. After the strips are leveled and nailed there may be a few low spots under the strips. Drive a wedge under the strip at the side of floor clip and then slush full with thin cement mortar to assure an absolutely firm and solid bearing. There will be no high spots to cut down. Having the workmen walk on the planks of the guide has also eliminated foot prints and many other irregularities.

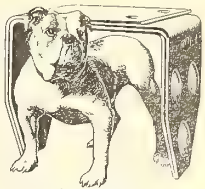
LAYING WOOD FLOOR.—After the sleepers have been securely fastened as just described, the wood finish floor, or the rough flooring if specified, is laid in the usual manner. No fill is required to hold the strips. Carpenters place the strips and lay the finish floor at the same time. There is no delay when time is precious waiting for a cement fill to dry out. The dead air space assists in sound deadening and prevents deterioration by dry rot of the sleepers and finished floor.

THE WESTERN STEEL PRODUCTS LTD.

Branches REGINA SASKATOON CALGARY EDMONTON

FLOOR CLIP

For Laying Wood Floors Over Concrete

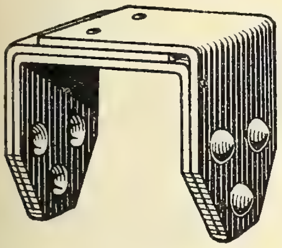


Put the BULL-DOG
on *your* Pay-roll

ON U. S. MARKET ONE YEAR—
OVER TEN MILLION SOLD

Saves Material — Saves Labor — Saves Money

ARCHITECTS & CONTRACTORS who have used BULL DOG FLOOR CLIPS say the BULL DOG METHOD is the best ever devised to hold a wood floor to concrete.



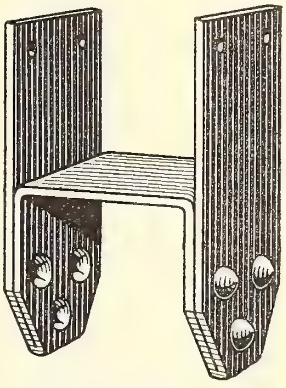
h 7. 1922
Canadian Pat. No. 216554, Mc.

Bull Dog Floor Clip as manufactured and placed in soft concrete, which allows free use of floor.

NO CONCRETE FILL REQUIRED: USE 2 x 2 unbevelled instead of 2 x 3 bevelled sleepers.

ACTUAL MONEY SAVED by eliminating a concrete fill and by using 2 x 2 unbevelled sleepers amounts to over 4c. a square foot of floor area; and over 3c. against a cinder concrete fill.

REDUCE DEAD LOAD:—Approximately 18,000 lbs. per 1,000 square feet by eliminating concrete fill; Great Saving in re-inforcing steel is effected.



Canadian Pat. 216554, Mc h
7. 1922

Bull Dog Floor Clip showing top members raised to receive floor strips.

SPEED UP BUILDING:—Unobstructed use of floor slab until you are ready to lay wood floor. Sleepers and finished floor can be laid at one time, thereby preventing costly delays waiting for fill material to dry out.

THE BULL DOG FLOOR CLIP is made of 20 Gauge KEYSTONE GALVANIZED COPPER-STEEL. They hold the sleepers so rigidly to the floor slab that buckling or squeaking of finished floor is impossible; neither will the finished floor dome up from moisture, which is often the case when a concrete fill is used.

ARCHITECTS:—By adopting The Bull Dog Method you eliminate all possibilities of hit or miss construction.

DRY ROT, which usually attacks a poor grade concrete or cinder-concrete fill and is in turn transmitted to the sleepers and finished floor, naturally will not take place; a slight circulation of air under the finished floor keeps it and the sleepers in perfect condition.

CONDUITS AND PIPES can be placed on top of the slab, right under the finished floor; are easy to get at; and are practically free from corrosion, whereas concrete fill corrodes them very quickly.

WINNIPEG — MANITOBA

Eastern Representatives:

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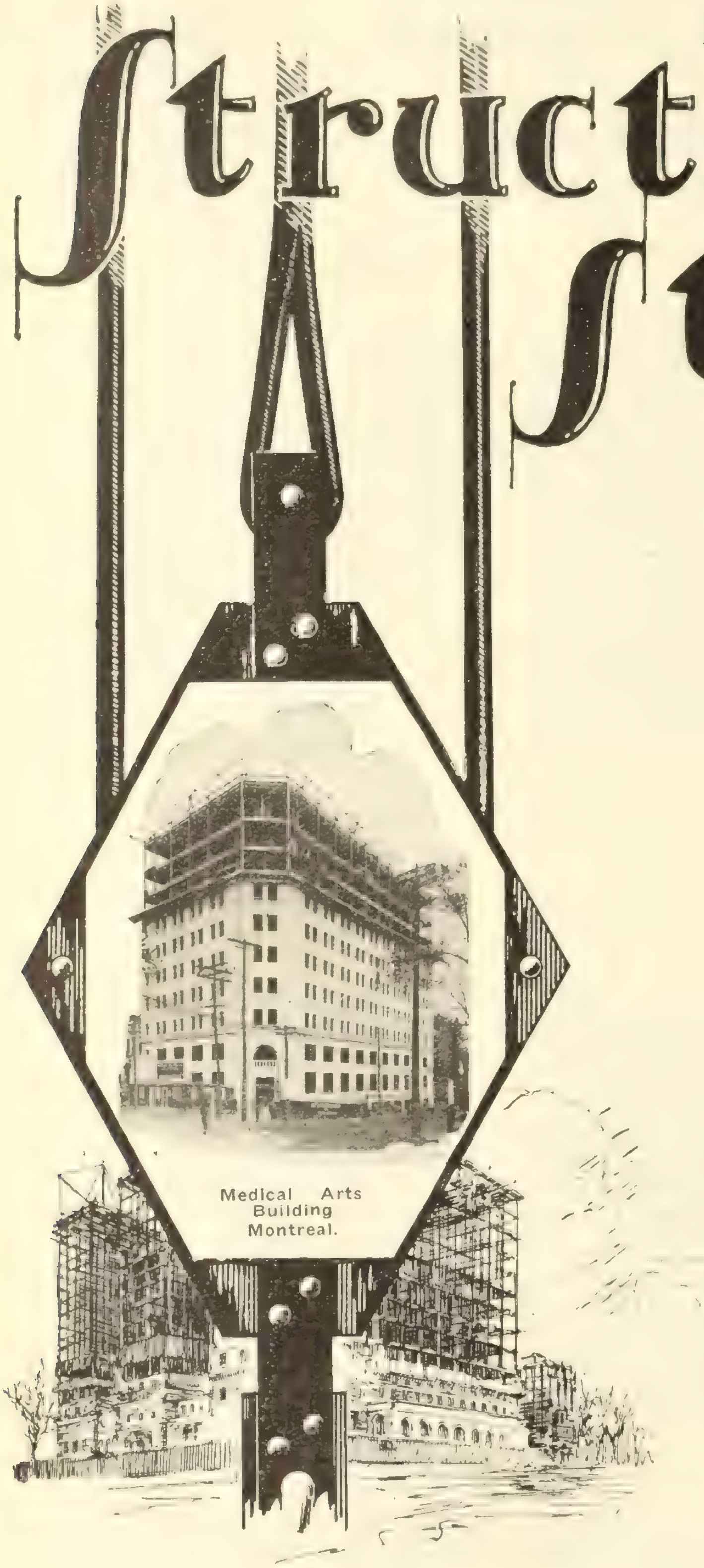
John Lindsay,
250 Richmond St. W., Toronto

BUILD WITH

Structural Steel



Medical Arts Building Montreal.

Steel Work Erected in ONE MONTH

Record for Ten-Storey Building

THE Medical Arts Building is one of the most recent buildings constructed in Montreal. Its frame work is ***Structural Steel,*** which was erected in the remarkably short time of one month, constituting a record for ten-storey buildings.

The building which is 80 x 150 feet, is located on the corner of Guy and Sherbrooke Streets. It will be used as an office building for the medical profession.

Issued by the
Structural Steel Association

If You Will Fill in This Coupon

You Will Get—

Tear this out--fill in--and mail to us today--no obligation to you whatever

Date ....

Place ....

To: Engineering & Machine Works of Canada, Limited,
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Dear Sirs:-

I am a Contractor and I am going to bid or to work on a job or jobs as per the following brief description:

....
(state whether it is ditching, foundation digging or road grading, give the approximate yardage to be removed, and, if
....
possible, a general idea of the nature of the soil).
....

I want you to tell me frankly just what the Keystone Excavator can likely do for me, what equipment I will need, what it will cost me to buy and what will my daily working costs be?

....

Name ....

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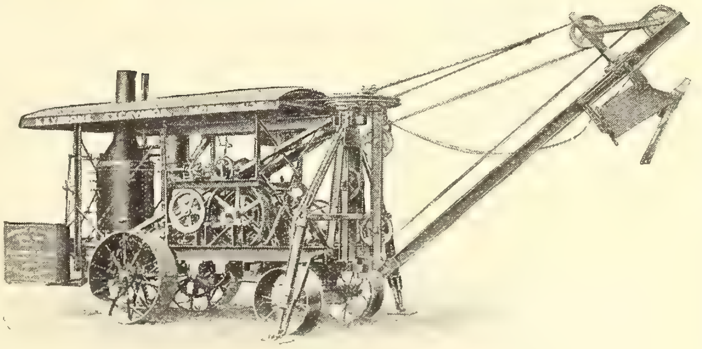

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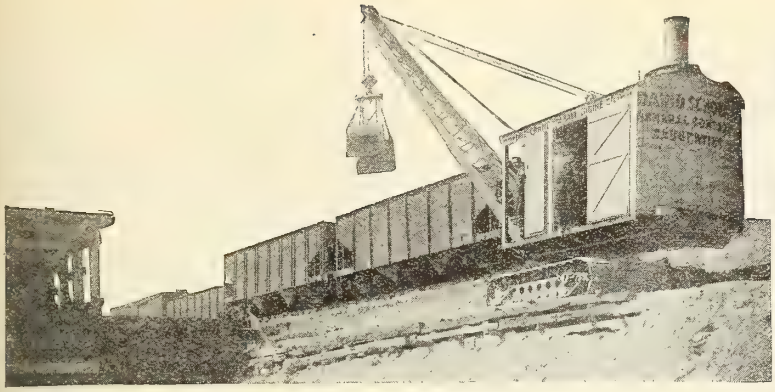

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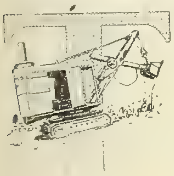
Be sure to get the **quickest acting** and **most reliable** crane that you can buy—

When unloading stone or gravel from cars to hopper, or to storage piles, the Erie Crane often averages 400 tons per day— or even better.

The Erie's speed comes from fast motions and extremely simple control. Only 3 operating levers and one foot-brake, to control every digging and swinging movement — frictions being released by steam rams. With one lever the clamshell bucket is closed, hoisted, and dumped.

And get a caterpillar type mounting that is **lubricated**— easy running and durable.

Erie Crane can be had on standard gauge car wheels or on traction wheels— as well as on the Erie **lubricated** caterpillar type mounting.



HE SAME MACHINE that unloads and rehandles your concrete aggregate will serve for all of your excavating.

Every Erie Crane can be easily and quickly changed to an Erie Steam Shovel, to handle such work as road grading, cellar excavation, trench digging, quarrying rock, etc. Two highly efficient machines, a shovel and a crane, at practically the price of one.

Compare the ERIE either as Shovel or Crane

The Erie Crane is best appreciated after it has been carefully compared with other cranes, both for output and reliability. The same is true of the Erie Shovel. Our most enthusiastic owners are those who have owned machines of other makes.

In buyng a shovel or crane it pays to select very carefully. Go and see some machines in your vicinity— talk to the owners and get their experiences. Two or three days spent in making sure that you buy **the best,** are days **well spent.**

Write us for names of Erie owners near you, who have purchased the Erie after using other shovels.

ERIE STEAM SHOVEL CO., Erie Pa., U.S.A.
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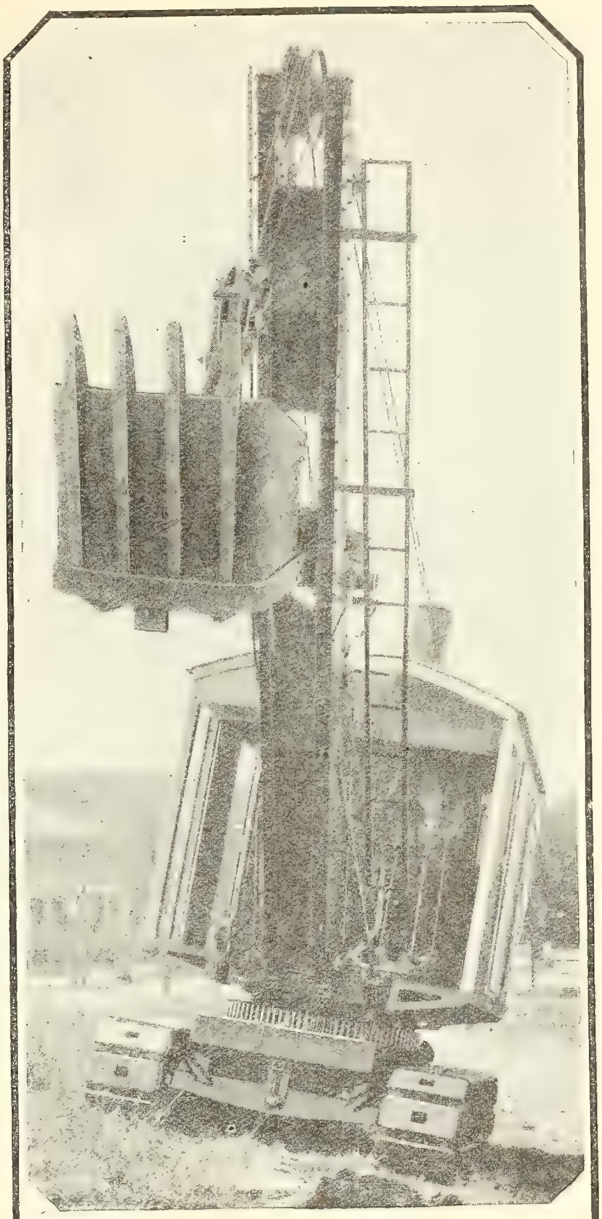


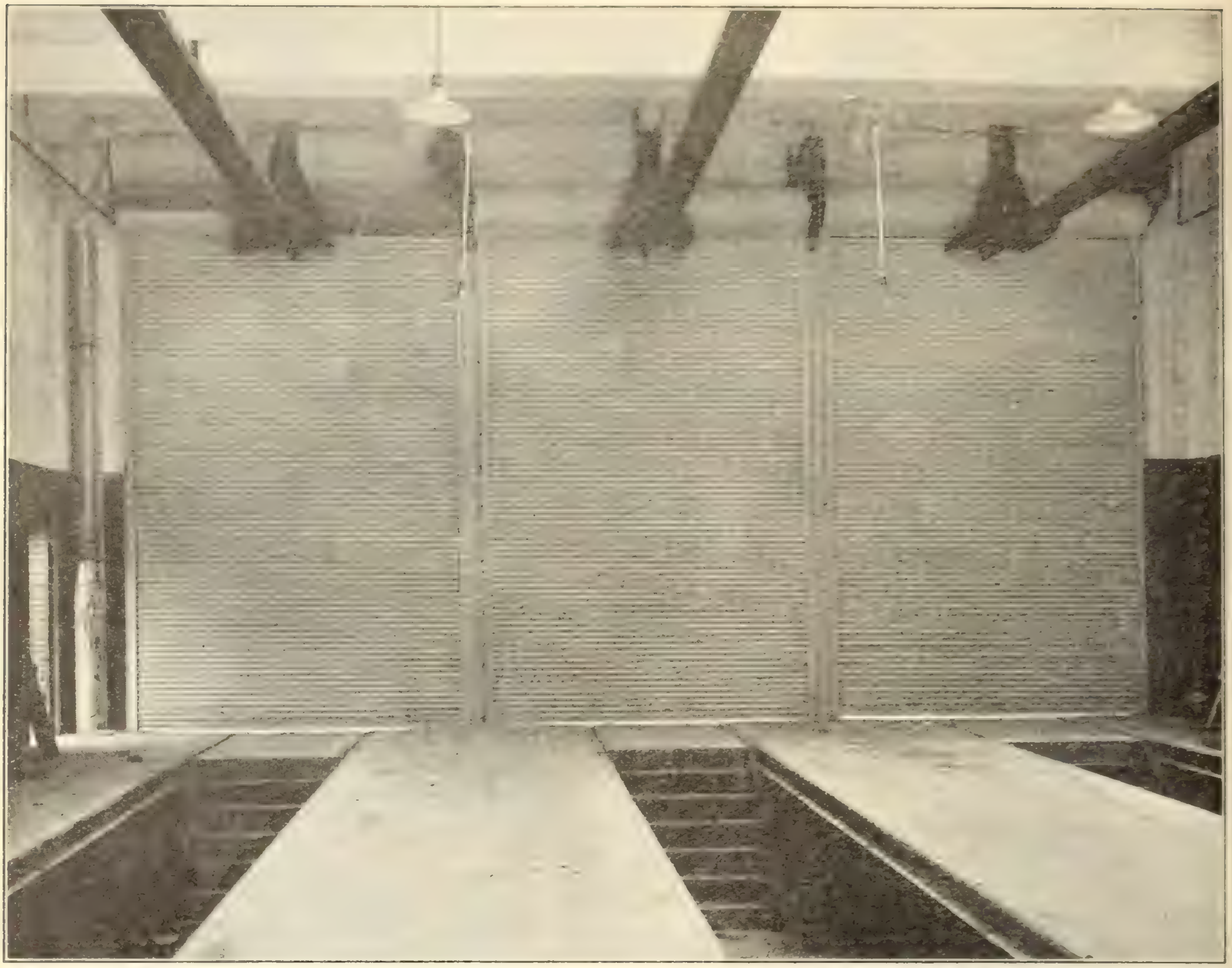
CANNOT slide off the treads

The caterpillar type Erie travels along a steep slope without the slightest danger of its rollers "sliding off the track."

High flanges on the TREADS (not on the rollers) eliminate all chance of "derailment"— this is absolutely unknown when you are using a caterpillar type Erie.

More than 700 Eries are now equipped with the Erie **lubricated** caterpillar type mounting. TRAVELS MORE THAN TWICE AS FAST as continuous tread mountings which run "Dry"— without lubrication of the tread link-pins. And it lasts several times as long because all bearing surfaces are automatically oiled, from internal reservoirs. There is no grinding of dry steel against dry steel. A caterpillar type Erie shows almost no wear after a length of travel that would ruin it if run without oil.

Full information about the Erie caterpillar type mounting in our Bulletin **C-60.** Write for a copy.



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No matter how large the opening to be protected or how located, Ormsby Rolling Steel Doors may be opened and closed easily. The ordinary sizes have counter-balancing springs and are very easy to raise or lower by hand. The larger doors are equipped with chain and gear: or may be motor driven as in the illustration shown above. In all sizes they offer the utmost in Fire Protection and command low Insurance Rates.

These doors require no swinging space or sliding room. They fit into many awkward corners where other types of doors could not be used.

They economize storage space and facilitate the handling of goods.

In designing or erecting Factories, Warehouses, Power Houses, Car Barns, etc., big savings in space and Insurance Rates can be effected bv the use of Ormsby Rolling Steel Doors.

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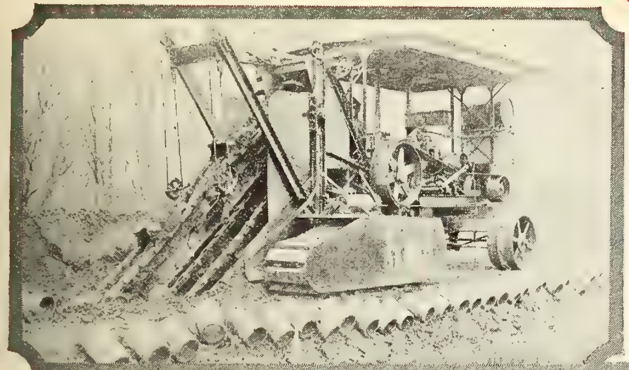

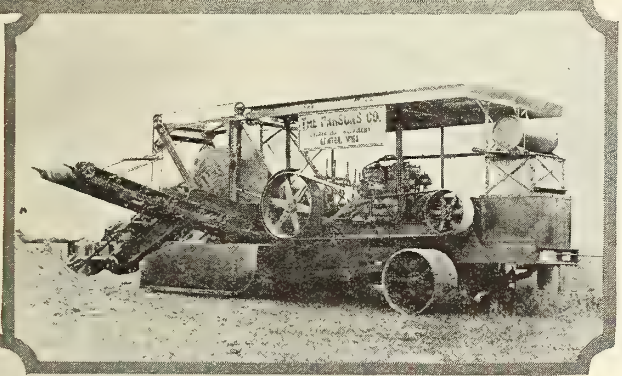

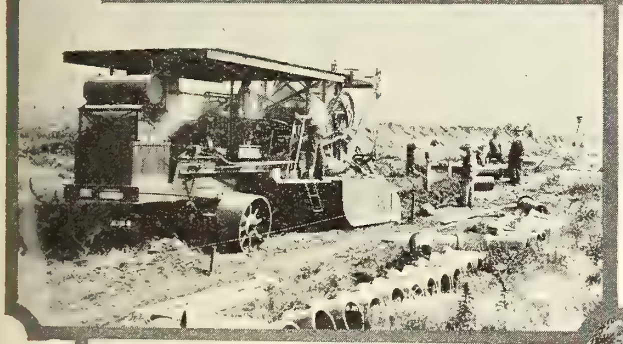

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Models 24, 36, 48 and 78 illustrated and model 20 Backfiller.

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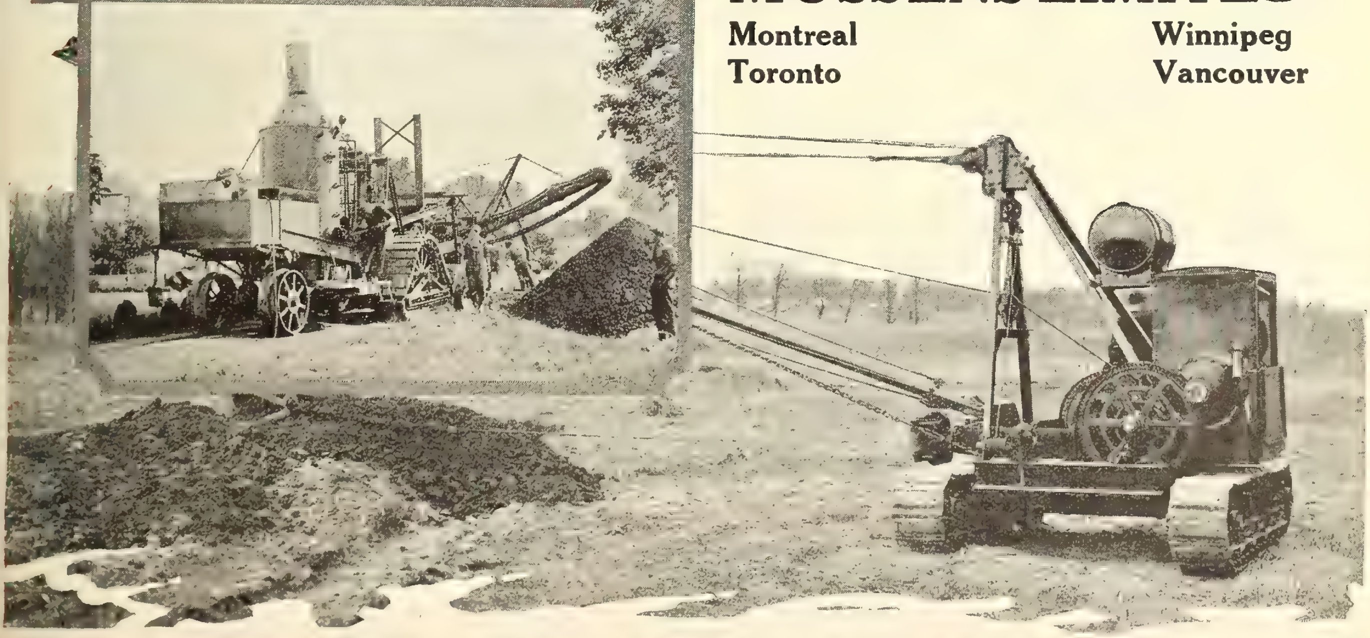

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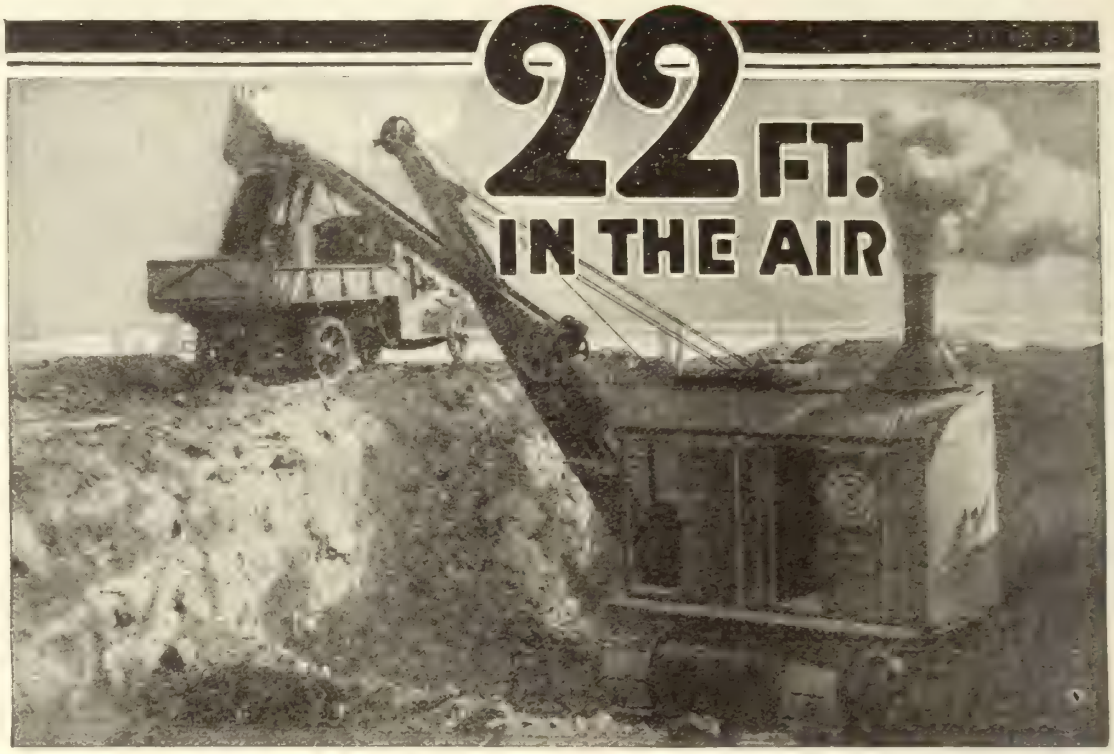

BUCYRUS 20-B BULLSEYE
¾-YARD SHOVEL

This is what R. M. Netherland Co. are doing in Pittsburgh. The Basement is 14 feet 2 inches deep. The lift is 22 feet. Note the full bucket. The BULLSEYE has power to pull through a heavy cut and thrust out the loaded dipper to this lift with no extra effort. It is this extra POWER and REACH that puts the Bucyrus in a class by itself among ¾-yard shovels. Here are a few more exclusive features:

SIMPLER TO OPERATE. Three levers for all digging motions. Throttle and ram controlled independently with one lever; propelled without having to shut steam off main ram. Release throttle that permits lowering dipper without brake. One lever for two speed changes.

LARGER BOILER. Greater heating surface and grate area; less water troubles because of patented scale chamber, another exclusive Bucyrus feature, enabling greater steaming efficiency and lengthening life of tubes. Better valves and improved arrangement of piping.

SUPERIOR CATERPILLARS. Simpler, more accessible; all bearings high out of mud; no side frames; links indestructible; high flanges on links, not rollers; cannot climb off treads; a continuous smooth platform with no gaps between links to catch rocks; rigid yet flexible.

UNIVERSAL MACHINE. May be equipped with long booms and dipper handles for high lifts; special dippers and handles for sewer work; dragline boom and bucket; clamshell or crane equipment, etc.

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Established 1880 *A Special Plant Devoted Exclusively to Small Revolving Shovels*

Railroad Type and Revolving Shovels of All Sizes, Dragline Excavators, Trench Excavators, Dipper, Hydraulic and Placer Dredges, Spreader Plows, Wrecking Cranes, etc.

Also Furnished with Dragline, Clamshell, Crane or Sewer Equipment
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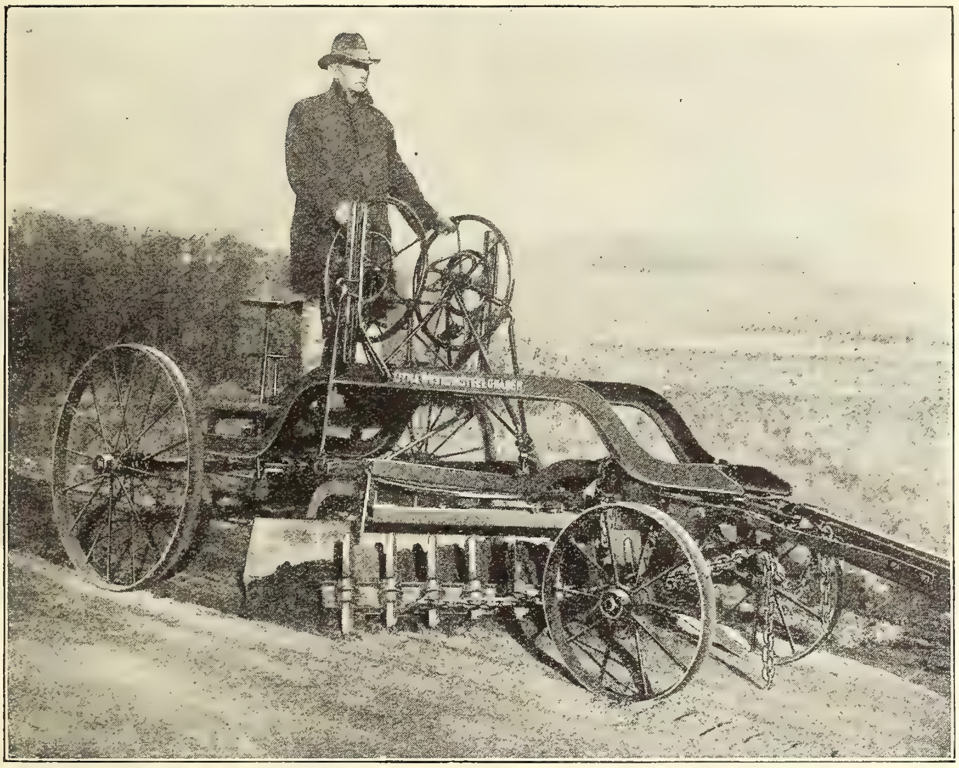
Practical Road Maintenance Under Motor Traffic



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Gravel Road Maintenance under motor traffic calls for a special tool to handle the situation.

We offer the Little Western Road Maintainer as an economical and practical solution of the new problems involved. It is a standard Little Western Road Machine, already favorably known in Canada, fitted with a scarifier attachment. The scarifier, carried in front of the blade, digs into the hard surface of the road to a depth of an inch or two and loosens up enough material for the filling of holes and small ruts by the blade.

The scarifier has great flexibility of adjustment, it moves with the blade, and can be regulated easily to a fraction of an inch. It can be made to ride clear of the ground when not needed for scarifying purposes.

We unreservedly recommend this new machine to our Canadian friends, as a practical and economical solution of the vexatious problem of road maintenance under motor traffic.

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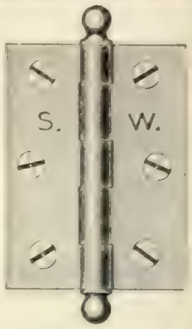

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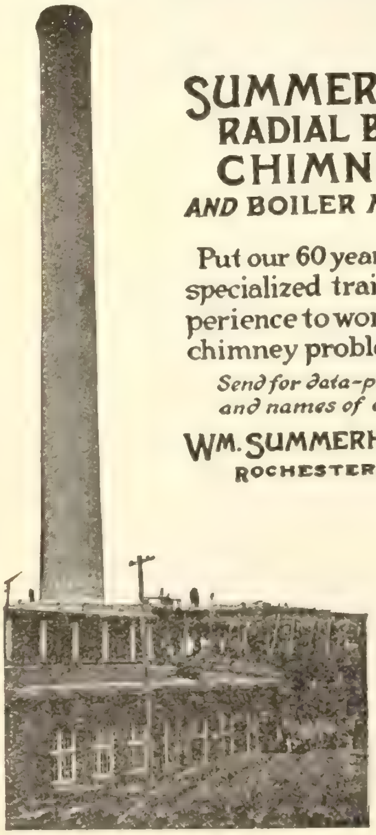

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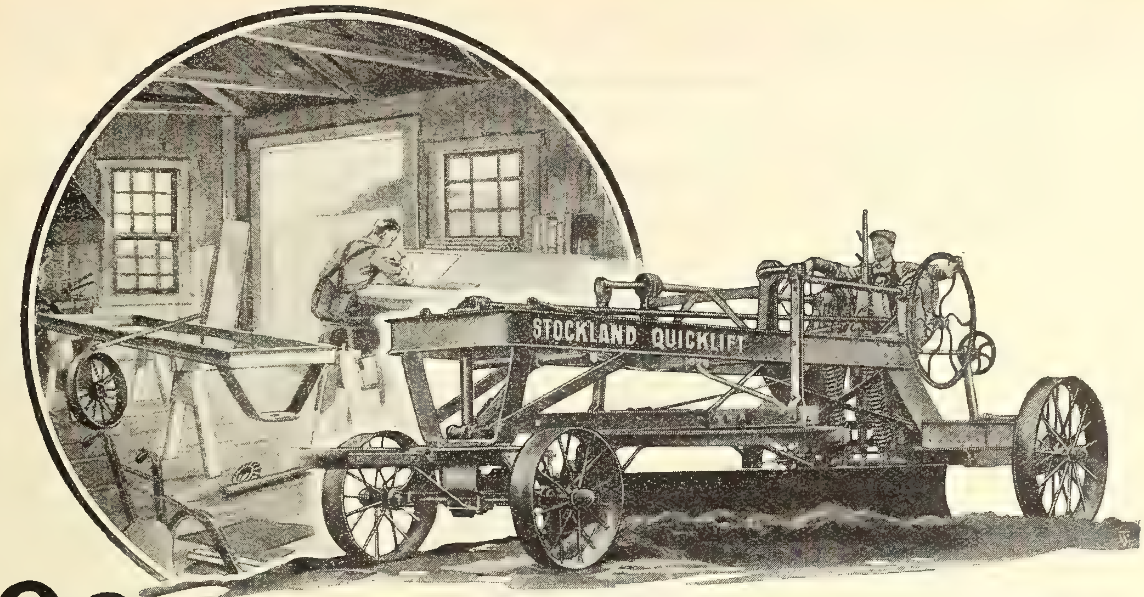

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The massive Stockland frame is built amply strong—one piece—hot riveted—and is *trussed* in all construction-size graders.

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Curved Moldboard and cutting blade give the Stockland extra working capacity with a saving of power—based on the 300-year-old *plow principle*.

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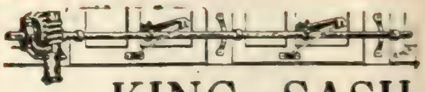

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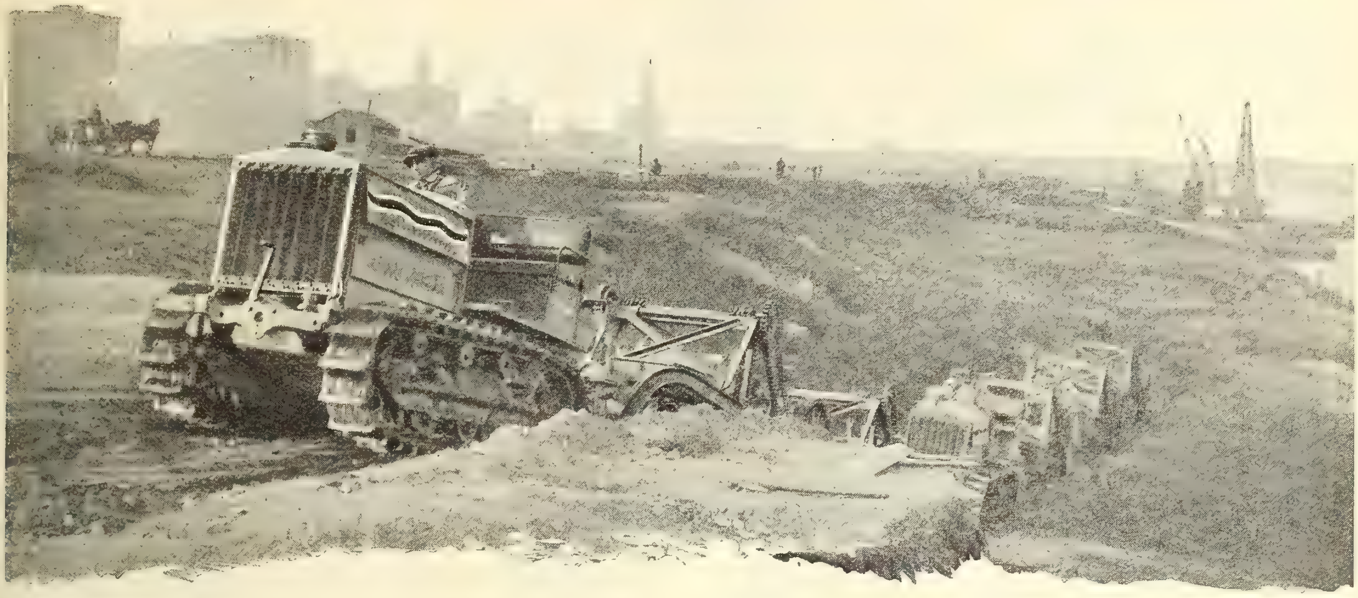

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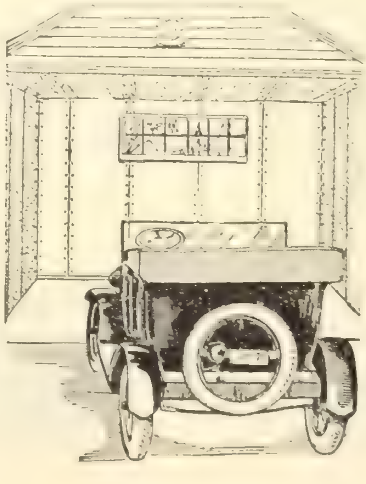

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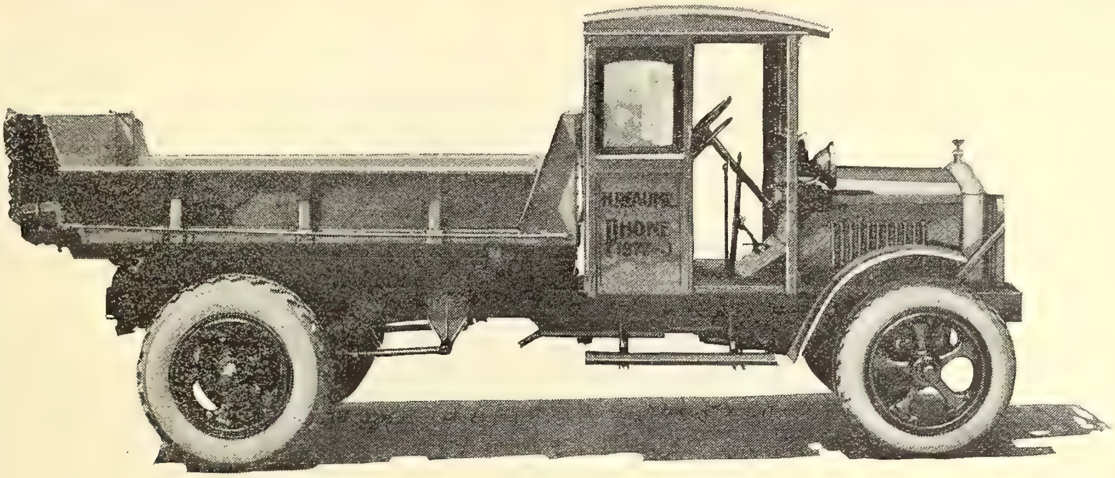

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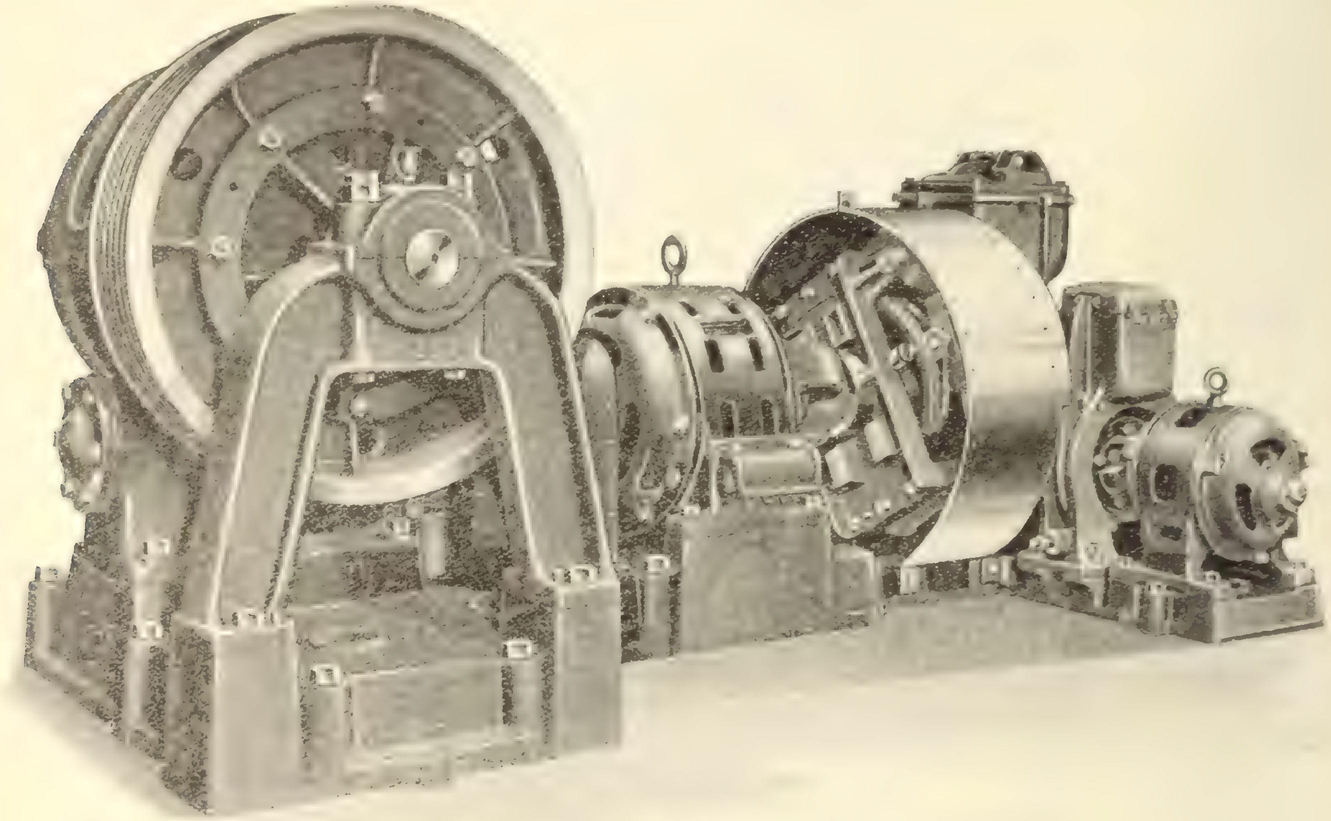

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ESTABLISHED 1886

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Labor Opposing Immigration

Mr. Tom. Moore says that the Dominion Government, in planning to bring intelligent settlers to Canada, is working against the interests of the labor man. Rather is it true, that in making this statement Tom. Moore is thinking only of the selfish and immediate interests of the labor man, to the total exclusion of every other class in Canada. Considering the fact that during the past summer skilled labor was at such a premium that building was held up both on account of labor shortage and consequent high wages; and considering also that there is very little unemployment in Canada right to-day before the construction and building season has opened up; also having in mind the acknowledged urgent need of some form of apprenticeship system to replenish the rapidly depleting ranks of skilled labor, it is difficult to see where he finds the basis for such a statement. If Tom Moore and his labor party should succeed in getting any material support for such propaganda as this the result would be seen in a still more complete paralysis of development work in general. The high wages and slow movements of the average workman, many of whom are operating on the theory that the less they do daily the longer the job will last, has more to do with high prices of everything those same workmen buy than anything else. It was recently stated by a prominent contractor that eighty five per cent of the cost of the manufacturers' finished product, on the average, was labor cost. This being the case Tom. Moore would only be consulting the interests of his own group if he right-about-faced on his policy.

The High Cost of Strikes

Strikes during 1922, according to latest government statistics, involved 41,050 workers who lost in the aggregate 1,975,276 days' wages. At the same time Canada lost the productive capacity of 1,975,276 days' work.

The financial loss to workers themselves can be calculated within fair limits for we can set an arbitrary average wage and multiply by the number of lost days. For an example let us suppose that the average daily wage of all classes of strikers during last year was five dollars; then, in actual money the strikers received $9,876,380 less than they might have, had they continued to work. That is close to $250.00 apiece. Think what this extra amount of money would have meant to those families, what it would have meant in stimulating the retail industry—upon which in turn, our manufacturing industries subsist.

But a still more serious loss is that sustained by the nation as a whole—in manufactured products. This amount is not so easy to estimate as the value of the manufactured product turned out by different classes of workmen varies greatly. Between the farm laborer, for example, who works for a wage that is frequently described as absorbing the total value of his product, to the worker on more specialized lines, there is a wide range. A coal miner probably receives less, on the average, than a quarter of the retail price of a ton of coal while the earnings of the operator in a hydro-electric generating plant would be quite negligible in comparison with the value of the product he sends out from his station. Supposing, however, we take the coal miner as the average—most of the strikes were in the coal fields—and suppose he receives one quarter of the value of the products—then the loss to the country, due to strikes, was about $40,000,000.

This figure is probably much too low but it serves to point the moral that our Dominion has a tremendous handicap imposed upon her industrial activities by strikes and unemployed workmen—conditions for which there is no sane excuse.

General view of the completed buildings of the St. Lawrence Paper Mills Ltd.

Further Addition to the Paper Making Industry

The New Plant of the St. Lawrence Paper Mills, Limited, at Three Rivers, P.Q., was Erected in Record Time — A Detailed Description of the Construction Methods

The title of this article refers more specially to the large new mill of The St. Lawrence Paper Mills, Limited, which has recently built at Three Rivers, Quebec. This mill is the most recent addition to the large number of paper mills which have lately been built in Canada. It is noteworthy that unusual speed was maintained in the construction of the mill and the installation of the machinery, the first sod being turned on the site about June 20th of last year and the full complement of buildings being practically completed by the end of September, just a little over three months after. In fact, the installation of machinery was begun on Sept. 28th, before the construction was entirely finished on all the buildings comprising the plant.

The Thompson-Starrett Company of Canada, were the building contractors for the buildings which in amount of money invested comprised about 85% of the total spent in all construction work. The speed and excellent work which were accomplished were due very largely to their untiring efforts in serving the owners in all ways that a large organization, such as theirs, can accomplish. There was the closest cooperation between the contractors and the company's engineers in regard to the job, as it requires a real mutual service to do so much work in so short a time. They lived up to their progress schedule delivered to the owners at the time the contract was placed with them, which was largely made possible by the methods they employed in getting material on the ground when it was required and carefully supervising its being put in the work. Estimates were, therefore, lived up to.

It is noticeable that these industries usually settle down in places where hydro power or hydro-electric power can be cheaply had. There are some cases where water power is used directly in parts of the manufacturing process, particularly in the ground wood mill where the wood is ground into pulp by large grindstones. In other processes direct application of water power cannot be so practical. There are many mills, of course, where hydro-electric power is mainly used but supplemented by steam power where the nature of the process demands direct current. As a rule, however, they follow the principle that where power is most easily available this is where they should endeavor to locate. There are many typical examples which could be pointed out but the one which comes most directly within our knowledge is the collection of several large mills on the lower reaches of the St. Maurice River. The main source of power is at Shawinigan Falls and the mills are all quite close, say up to 20 miles distant.

There is, of course, one other very good reason for locating close to a large river and that is the question of transportation of raw material in the form of logs. If this work can be done by natural agents it naturally involves considerable reduction in the cost of the raw material delivered on the wood-pile. No natural agent is quite so efficient for this purpose as a large well-regulated river. Thus there is the two-fold purpose in building in communities,—to take advantage of the power available for transporting the logs and finally converting them into paper.

Extensive Building Required

The nature of the paper-making industry and the obvious reasons for its becoming established in thinly populated parts of the country have combined to introduce an extensive style of building construction. Land in these places is in most cases relatively cheap, being in many cases rough bush land, maybe farm land, but rarely in the populated areas where land values are high. Under these circumstances it is undoubtedly cheaper to utilize the greater land area available by keeping the buildings as nearly as possible on one level. The cost of building construction increases in direct ratio to the height. If it is possible to increase the cubic contents by spreading laterally it is much cheaper per cubic foot of space than increasing in a vertical direction, providing the initial cost of land is low. This theory is amply proven by considering our city loft buildings whivh rise to great heights in order to cut down the initial cost of land.

Short Description of Process of Paper-Making

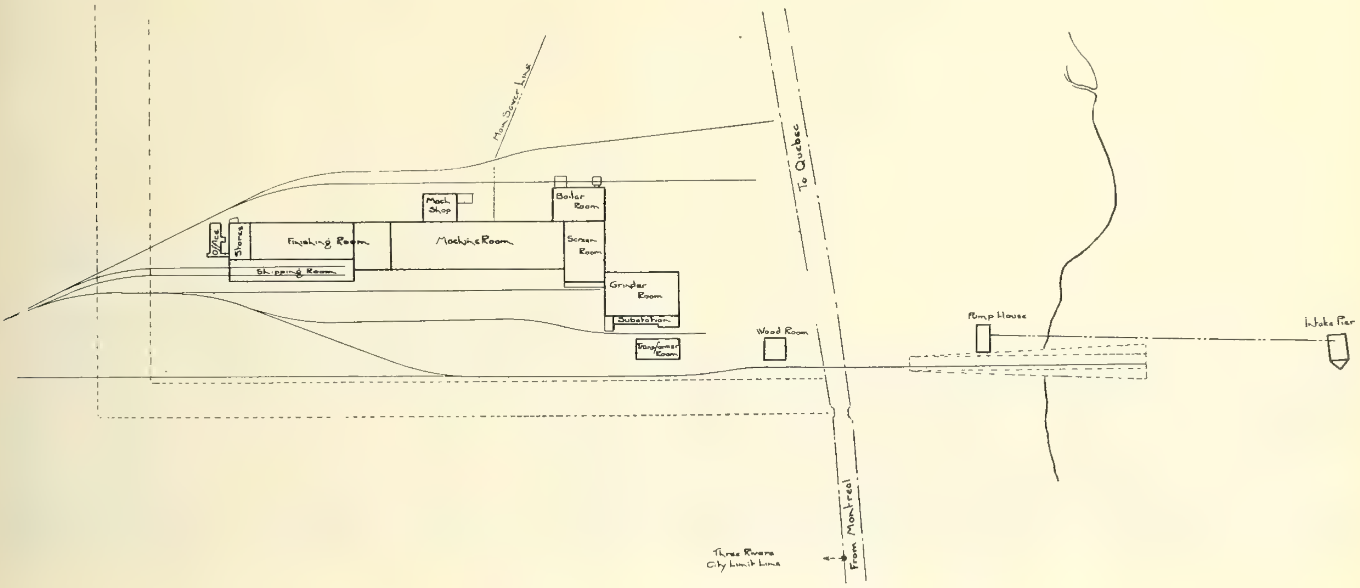
Referring to the block plan which accompanies this article it will be noted that the layout was made to follow a straight line flow between raw material and the finished product as far as possible, in contrast with the other plan adopted, of placing the buildings side by side instead of end to end. That this object has been fairly successfully attained is quite obvious by referring to the plan. Step follows step and process follows process, from the raw material, which in this case consists of pulpwood, to the finished product wrapped and ready for shipping—newsprint.

The raw material, wood or pulpwood, enters the wood room where it is thoroughly cleaned of snow, ice and dirt. From there it passes to the grinder room and through the magazine grinders (there are eight of these huge machines) which reduce the logs of wood to a pulp consisting of fine fibre mixed with a large quantity of water. From there it passes to the screen room where it goes through the various stages of refinement for the removal of impurities and leaves a semi-finished product ready for manufacture of newsprint. From the screen room it is mixed with proper proportions of sulphite pulp, and color is added to whiten the sheet. From there it passes to the paper machines each of which has a capacity of 75 tons of finished paper every 24 hours

After leaving the paper machines, it is trimmed to the proper sizes and made into large rolls of paper for high speed newspaper printing presses.

In the finishing room it is carefully wrapped and protected for shipment in order that the purchaser may receive the article in perfect condition for his use.

It might be interesting to know that the production of a mill of this size is sufficient to make a web of paper 6 feet wide reaching from Montreal to just this side of Winnipeg, or about 900 miles.



Plan of the St. Lawrence Paper Mills plant

It is beyond the scope of this article to describe in detail the processes of the manufacture of newsprint paper from pulp wood.

Type of Construction

In general the main block of buildings are of standard modern fireproof construction of steel, brick and concrete. The steel work of the buildings is the self-contained type, no wall bearing beams having been used throughout the whole general construction. By this means, not only was a considerable economy effected in the thickness of walls, but an increase in the rapidity of construction was achieved, as it was possible for the steel workers to complete the erection of the steel work without waiting for any other building trades. The walls are of brick and the general wall thickness is only 12 inches.

The foundations are all of reinforced concrete, though varying in size and type according to the purpose for which they are intended. The foundations under the walls are placed on wooden piles and the concrete carried up to a point about 5 ft. above grade. This same type was placed under heavy concentrated loads and in the other places where vibration of the machinery in the building demanded a non-depressible foundation.

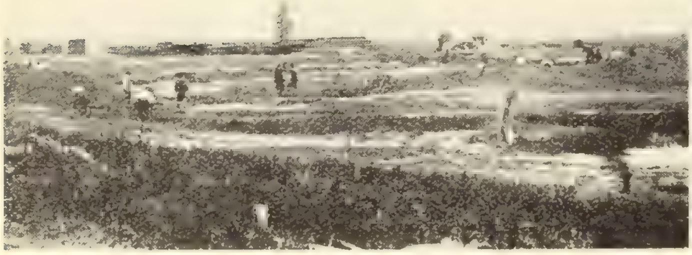
There were about 2,500 wooden piles of various lengths used for this class of work. These piles varied considerably in length even in the area of one footing. This is a fact which is very hard to explain. It might be caused by the presence of a stratum containing large boulders although this does not seem probable when the soil conditions are considered. Sand, of course, is very hard to drive through if dry and so is clay hard-pan, but if these formations were present then why not boulders? The writer, during his college days, had experience in this vicinity on another piling job where the piles both large and small, long or short were easily driven to a depth of 25 feet, but if allowed to stand for a short time would be so firmly gripped by the soil around them that they would practically refuse to budge. The sandy loam being practically saturated with water would permit of easy driving so long as the pile was kept moving but if left for a short time the sand would settle into place around the pile and exert a tremendous frictional resistence. The excavations for the concrete caps on the piles were originally carried down below cut-off elevation to sub-grade so that the piles would project well into the caps. The reinforcing in the caps was placed several inches above cut-off elevation and in the usual 2-way standard practice. These piles were driven by Wm. I. Bishop Ltd., of Montreal, who had two pile drivers on the work, which was completed on time.

The footings under columns which were not transmitting unusually heavy loads were of the common spread footing type, decreasing in area as the elevation increased. About 3 or 4 changes in area occurred between the ground level and the base of the steel column.

The other type of footing used was the reinforced concrete mat which is really a spread footing carried to the extreme. This type of footing was used under heavy loads which occurred in the form of large tanks containing pulp stock.

The form work in these foundations was not heavy nor did it require unusual bracing or wiring for the reason that the area inside the form was large and the concrete first poured had taken its initial set before much additional concrete was poured.

The whole area of the boiler-house is underlain by a concrete mat and the part under the smoke stack is further supported on piles. In most cases where a mat type of foundation was used the allowable pressure was taken at about 2,000 pounds per cubic square foot, a figure which was decided upon after an extensive series of earth pressure tests.



View of site shortly after start of work

Stage of construction less than three months later

Walls of Brick

The walls are of solid brick, 12 inches thick, throughout all buildings, Citadel buff brick being used with no finishing coat applied inside. This brick is made at Quebec City and is often used in places where it remains exposed on the inside as well as the outside of the wall as it presents a pleasing appearance. The bricklayers worked from scaffolds hung from the roof and adjusted by means of winches on the scaffolds themselves. This system is well-known and widely used on account of the ultimate saving in scaffold costs and speed of manipulation.

The window frames are of wood and are of the box and counterweight type and contain two panes of glass in each panel, the object being to provide proper insulation against winter temperatures without the addition of the second sash. This should be quite effective providing the frame is set properly in the wall. This system of window construction may not be original, but is certainly unusual, and no doubt serves to reduce expense while providing the necessary obstacle to the entrance of cold air. This is one of the unusual features in the design of the mill, and indicates a carefully considered desire to economize without sacrificing comfort and efficiency. The individual small panes of glass are about 8 in. by 10 inches. No putty is used in the glazing.

Gypsum Roof

The roofs are entirely of gypsum, 4 in. thick, and reinforced with expanded metal laid directly across the roof beams. This work was undertaken and successfully completed by the Keystone Fireproofing Co., of Indianapolis, U.S.A. The Canadian Johns-Manville Co. placed the gravel roof covering which is the final step in the process. It should be noted that the underside of the gypsum layer comes well below the top flange of the roof beams in order to entirely cover the expanded metal which hangs across the beams in the form of a "catenary." This expanded metal carries all the roof load in the form of snow, etc., as gypsum has no tensile strength. The form work was of course hung from the roof beams so that speed in form construction and saving in bracing were both attained. The forms came in between the top and bottom flanges of the roof beams and the bottom flanges served as sufficient support for all purposes. Various styles of placing forms might be adopted under the circumstances depending upon the particular idea of the contractor.

The floors throughout the entire mill are of reinforced concrete supported by the steel floor beams which are in their turn framed into the steel columns. The floors vary in thickness according to the live load which they are intended to support. The steel floor beams have been haunched on the sides but not on the bottoms. The form work was hung from steel form beams and the spans between the floor beams were short enough in all cases to do away with the use of struts to the floor below. The floors are surfaced with various materials such as asphalt wood-block, cast iron, etc., but generally speaking, the finished concrete is being used as the wearing surface. In the grinder room charging floor, where the pulpwood coming from the wood piles drops from the conveyor to the floor, the wood block floor has been placed. This is 4 in. creosoted wood block laid in a thin layer of asphalt. And so on in other parts of the mill where special conditions warranted, a special type of floor surface was laid directly on the concrete. Of special interest in this connection is the surfacing on the shipping platforms which consists of strips of cast iron laid on edge in two directions and the squares thus formed filled with concrete. The cast iron strips should guarantee an almost indefinite length of life to the surface under heavy wear caused by trucking.

In the process of manufacturing paper it is necessary that a large number of tanks for the storage ot stock at various stages of manufacture be provided in the mill. In the case of the St. Lawrence, all the stock tanks in the mill have been built from reinforced concrete. These tanks are of varous sizes, capacity, shapes and designs. All of them have to be built to retain a water head without leakage or seepage. All of these tanks were built without the use of any water-proofing compound, merely being Portland cement and properly graded aggregate. The majority of tanks have to retain the equivalent of 18 feet of water and this has been done with the use of a 16 inch wall, generally speaking. One of the largest of these tanks comes in the screen room, being about 65 feet long and 50 feet wide. There are a number of passages in this tank built to force the stock to flow in a deviated path through the tank. This tank is approximately 18 feet high. No difficulty whatever has been experienced with seepage from the time it was put in operation.

It is interesting to note that all concrete used in the construction of this mill was proportioned according to the Abram's specifications which are based on the water-cement ratio theory and fineness modulus. Periodical test cylinders were taken from the concrete and tested in the laboratory for their crushing strength and in all cases were found to pass the specified test for the class of concrete required. No serious difficulty was experienced in this method of proportioning concrete and the desired results in obtaining of definite strength, with less guess-work than usually exists in the 1—2—4 method of proportioning, was obtained.

The reinforced concrete work in these tanks and in other parts of the mill is of a very intricate nature requiring unusually strong, heavy formwork. The walls of these passages in certain tanks and under the paper machines are very thin, in some cases about 4 in. thick. A thin wall like this necessitates very careful mixing of concrete and also unusually careful placing. On account of the rapidity with which the form fills up with concrete it is also necessary to add extra bracing in both horizontal and vertical directions near the bottom of the form. The writer had no opportunity to examine the results obtained in the tanks but that underneath the paper machines has been remarkably well done and is probably a criterion.

(To be continued)

The Canadian Mead-Morrison Company, Ltd., are distributing pamphlet No. 701 describing the Cello projector, which is a practical moving picture machine for homes, schools, churches, clubs, hospitals, etc. The United States factory of this company has been selling this machine for some time and the Canadian company is now starting the distribution of it in Canada.

Toronto E.I.C. Elects Officers

The Toronto Branch of the Engineering Institute of Canada held its annual meeting at the Engineers' Club, on Thursday evening, March 15. The principal subject of discussion at the meeting was the part the engineer is taking in the local and national problems of the country, it being generally felt that the profession was not active enough in this respect and that the public would welcome expert engineering opinion on these problems connected with public undertakings. The discussion of these problems at the branch meetings was advocated and the advisability of holding debates on these subjects is being considered.

The report of the secretary, Mr. O. M. Falls, showed the branch to be in good financial condition and with a membership of 650. The following new officers were elected for this year: Chairman, Prof. C. R. Young; vice-chairman, J. M. Oxley; secretary, J. A. Knight; committee, Prof. P. Gillespie,, Prof. T. R. Loudon and J. G. R. Wainwright. The retiring chairman, Mr. Wm. Storrie, was accorded a hearty vote of thanks for his work on behalf of the branch during the past year.

New Cantilever Bridge over Niagara

Announcement is made that work will commence in the early spring on the new cantilever bridge across the Niagara River alongside the present structure. The new bridge arch will be of the two-hinged spandrel-braced type, to suit gorge conditions. The rail base will be 240 feet above the water level of the lower river.

The structure of the arch itself will include 4,800 tons of steel, with bracings and castings. A further weight of 1,250 tons will be contained in the floor. Nearly 1,500 tons of steel will be required for the 200-foot approach girder spans. The total weight of steel will be about 7,500 tons. About 1,100 cubic yards of concrete will be required in the abutments and auxiliary foundations.

Some novel engineering features will enter into the construction of the new bridge. Shafts six by seven feet will be tunnelled from the face of the cliffs on each side of the river bank through the solid rock, in a downward slant for a distance of 60 feet and large chambers excavated at the inner ends, wherein will be installed, in concrete, the erection anchorages. Each half of the arch will be erected as a cantilever, being held by an eyebar tier running back to the anchorage in the side of the cliff. The American Bridge Company has the steelwork contract.

Papers on Hydro-electric Development

At the first technical session of the spring meeting of the A.S.M.E. at Montreal, Canada, May, 28-31, two papers on hydro-electric development in Canada will be presented. "The Development of Hydro-electric Power Plants in Ontario," and "Power Development in the Province of Quebec" will be presented respectively by Fred. A. Gaby, chief engineer of the Hydro-electric Power Commission of Ontario and Julian C. Smith, vice-president and chief engineer of the Shawinigan Co.

Want Extension of Time on Road Grant

The Saskatchewan Good Roads Association Will Request the Dominion Government to Give Some Leeway—Saskatchewan's Problem is to Build Good Roads but Cheap Ones

Extension of the time of the federal grant for road building in Saskatchewan was requested in a resolution passed unanimously by the Saskatchewan Good Roads Association in convention in Regina on March 5.

Addresses from ex-Mayor Grassick, president of the association; city commissioner L. A. Thornton, H. S. Carpenter, deputy minister of highways, and Hon. S. J. Latta, minister of education and former minister of highways, occupied most of the time of the convention, and in these talks, much information relative to the making and keeping of good roads throughout the province was given.

Officers Elected

Officers were elected as follows: Honorary president, Hon. S. J. Latta; president, W. E. Dennison, Assiniboia; vice-president, Sheriff L. G. Calder, Saskatoon. Ex-president Grassick will also serve on the executive. Other members of the executive will be L. A. Thornton, Dr. W. Henderson, E. G. Hingley, T. Teare, Marquis; J. G. Laycock, Swift Current; A. C. Garner, W. E. Hodge, Moose Jaw; H. S. Carpenter, J. McQuarrie, Saskatoon, and Thomas Moffatt. The secretary is to be appointed by the executive. I. H. Bowman, Regina, now holds that office.

The proposed constitution of the Good Roads Association, drawn up at a previous meeting, was adopted with some minor changes. It was decided that the head office of the association will be in Regina. In view of the difficulty encountered last year in obtaining a quorum of the executive, this was made three instead of seven.

The address of Mr. Latta, on "Road Maintenance" was the main feature of the convention which was attended by about 50 members.

"The surveyors who fixed the road allowances for us long ago," he said, "seem not to have considered that we might some day really build roads on those allowances. The result is that we have to encounter tremendous difficulties in placing our roads on the sites chosen by them."

He also referred to the enormous overhead expense which the province has to bear in connection with the roads, on account of the fact that the population is less than 800,000.

Must Build Well But Cheaply

"Because of lack of funds, we have had to neglect to some extent our road-building work," said the minister. "Our problem is to build as good a road as we can, with as little money as possible. We have had to do so much repair work that we have had little money left for road building."

He pointed out that thousands of dollars might be saved for new expenditures in road-building, by paying attention to small damages to roads already in operation. "Maintenance is a very important point," he said. "There are hundreds of pieces of road needing small repairs in this province, which, if looked after promptly, will prevent much larger damage." In respect to this, he declared that responsibility for road maintenance ought to be clearly defined. If the federal government, the provincial government and the municipalities are all to have a share in financing it, there ought to be a definite and specific arrangement made whereby responsibility would be properly placed. Each body should know what is expected of it."

He went on to outline the principles which should guide those maintaining the roads of the province. "It is good business," he said, "to maintain the capital you have invested. Don't let your investment deteriorate. This applies to small pieces of road as well as to larger pieces. It is as important to protect an investment of $100 capital as $10,000 worth. Keep your roads up to the standard on which they were first built.

"The first principle to be recognized by all road builders is that the greatest enemy to road is water. The important thing is to keep your grade dry. If you do that, the chances are largely in favor of the road maintaining itself. I would go so far as to say that you can't spend too much money in keeping water away from your grade. I was never on one road in my life that had too many culverts or too much ditching. We don't keep a road smooth to make it attractive to traffic; we do so to keep it dry." The main problems of maintaining in good condition the road between Regina and Moose Jaw would be solved if the road could be kept dry, he added.

He urged efficient dragging, especially after a rainstorm, and just before freezeup, as a means of keeping roads in good condition; also keeping traffic as much as possible in the centre of the road; placing culverts so as to prevent water from attacking the subgrade; and proper draining.

"It is not necessary to make the surface of your grade like the gabled top of a building," he said. "Water will run downhill, no matter how small a drop you have. About six inches in 20 feet should be sufficient."

Dragging is Important

Dragging should never be neglected, he declared. A well-dragged road, which was efficiently kept up to repair in other ways, should pay for itself in four or five years.

With regard to ditches, these should be made not too near to the road itself, and they should be connected up in a system, so as to drain water off into some slough or other body of water. "If such a thing is impossible in your district," he said, "dig your ditches wide and shallow, so that water will evaporate rapidly."

Mr. Carpentier intimated that he hoped the association would in time become much stronger than it is today, for such a body, he thought, could be of great assistance to the department in connection with spreading facts about road building and maintenance.

"It is very necessary," he said, "that we should have the co-operation of the people of our rural municipalities. For several years past, rural municipalities have spent more on road building than either the provincial government or urban centres. During the past two years, the rural municipalities have spent at least as much as the department."

He went on to outline the work of the department, making reference to the same point touched upon by Mr. Latta, of the fact that road allowances were often in the most inconvenient of places.

Explains Federal System

He explained the federal aid grant system, by which $20,000,000 was set aside in 1919 to assist provinces in building roads. This was allotted in proportion to the population, Saskatchewan's share being $1,800,000. The province had to earn this sum, which was given on a basis of 60 per cent. of work done by the province and 40 per cent. by the Dominion. Saskatchewan was unable to start on its road-building program until 1921, and the grant expires March 31, 1924. By that time the entire grant will not have been earned, though a large program of work is planned for the next few years, and if the Dominion will grant an extension of the time limit, the provincial department feels confident that the whole grant will be made available. An extension of two years, Mr. Carpenter thought, would solve the problem.

In this connection the association passed the resolution approving of the principle of federal aid for road building, and asking that the time be extended for those provinces which have not been able to take full advantage of the grant made in 1919. A copy of the resolution will be forwarded to Saskatchewan members in the Dominion House.

Commissioner Thornton presented greetings to the visiting delegates on behalf of the city. Regina, he said, felt that it was time, after the slack years during and subsequent to the war, to launch out on a good roads program, and with this end in view, a paving program was at present under discussion in the city council. While such a program was important to the city, it was even more so in rural centres, he said. Roads were the means whereby business and social communications must be carried out in the rural districts, and their building and upkeep was consequently a very important matter.

A short summary of all work so far accomplished by the association was given by Mr. Bowman, secretary. He expressed the opinion that when the Good Roads Association became sufficiently established, it would act as a clearing house for at least half a dozen organizations attempting similar things.

How Should Concrete Oil Tanks be Built?

Practice Recommended by the American Concrete Institute for the Construction of Fuel Oil Storage Tanks—Specifications for the Materials

Concrete tanks are recommended for the storage of fuel oil when the specific gravity of the liquid is heavier than 35 degree Baume at 60 degree Fahrenheit, but should not ordinarily be used for lighter oils.

Fuel oil tanks should be located so as to decrease the fire hazard to a minimum. Their design, location and equipment must be considered from several viewpoints,—that of the owner, the insurance underwriter, the municipality in which they are to be built, the oil-burner and equipment company making the mechanical installation and that of the engineer having charge of the design of the complete layout.

The owner selects a site, preferably for economic use of space in handling the fuel oil. If tanks are to be buried, he determines what load the roof shall carry. He also determines the capacity of the tank or tanks to insure storage of sufficient oil for consumption over a specified period of time.

The insurance underwriters take into consideration the fire hazard presented by each individual installation, and advise the owner as to the capacity allowed under the conditions proposed, and as to the acceptability to them of the proposed pumping and piping layout. They also require certain safety appliances which may or may not have been embodied in the plans of the equipment company.

The municipality may have regulations governing the storage of fuel oil. If there are such regulations, the approval of the officials in charge must be obtained, and when obtained it sometimes becomes necessary to obtain building permits from the proper authorities.

The oil burner and equipment company usually designs the supply and feed piping, the pumps, the safety appliances, determines their location and the location of the fittings in contact with the tank, installs heating coils for rising the temperature of the oil for pumping where required and in general does all of the detail work pertaining to the mechanical installation of the system.

Carrying Out the Design

A competent experienced designing and constructing concrete engineer, satisfactory to or representing the owners should be responsible for the design of the concrete tank, should inspect its construction, especially during the placing of the concrete, and should have authority to harmonize the different interests.

Care should be taken in the design to provide for all external and internal stresses; namely, hydrostatic pressure of contents, external hydrostatic pressure from the ground upon the floor and walls, earth pressure on walls, and live and dead load on roof.

In continuous or restrained members, positive and negative bending moments should be given equal consideration. Temperature reinforcement should be placed in the walls and floor independent of other reinforcement, the steel ratio being not less than one-third of one per cent. The maximum range in temperature should be predetermined as a basis of calculation.

While the hydrostatic pressure of water in soils is about 50 per cent of the full hydrostatic pressure, it is recommended that not less than 52½ lb. per sq. ft. for the full head of water be assumed and allow the difference as a factor of safety for unseen conditions.

Steel in tension whether in circumferential tension or in tension due to negative bending moments on the face of tank walls or floor exposed to the oil, should be designed for a safe working stress of 10,000 lb. per sq. in. In circumferential walls, the thickness of the concrete should be based upon a maximum tensile strength in the concrete of 150 lbs. per sq. in., but a minimum thickness of 8 in. at the top and 10 in. at the bottom of walls is recommended to give space for spading. Working stresses in the concrete or steel not otherwise covered should conform with the recommendation of the current report of the Joint Committee on Concrete and Reinforced Concrete.

All tanks should be built with a concrete roof. The roof should be made gas-tight at the junction with walls, and should be constructed without unprotected openings.

At least two manholes should be provided for each tank 20 ft. in diameter and over and one manhole for tanks of lesser diameter. The multiplicity of manholes is recommended so that oil vapors or gases may be more quickly diffused when the tank is opened prior to being cleaned out and other work being done within.

Fittings for pipe connections and attachments to hold heating coils should be placed where shown on the plans.

The tanks should be set on firm, well tamped earth, rock or other suitable foundation to guard against settlement. The foundations should be constructed to provide full bearing for the tank bottom.

In order to carry out the recommendations contained herein, the service of competent engineers and engineering contractors experienced in this work are required in making the design and specifications and in superintending the construction.

Reinforcement

Specifications:—The reinforcing metal should meet the requirements of the current standard specifications for billet steel reinforcement of the American Society for Testing Materials excepting that twisted square bars should not be employed in the construction. Reinforcing should be free from excessive rust, scale, paint or coatings of any character which would tend to reduce or destroy the bond.

Splicing:—Wherever it is necessary to splice the reinforcement, no lap-splice should be less than forty (40) diameters. No two laps of adjacent rods should be directly opposite each other in circular walls.

Placing:—Reinforcing steel should be cleaned of all mill and rust scales before being placed in the forms. All reinforcement should be bent or curved true to templates, placed in its proper position as required by the plans and securely wired or fastened in place, well in advance of the concreting. Reinforcement should be inspected and approved by the engineer before any concrete is deposited.

Concrete Specifications, Materials

Cement.—The cement should meet the requirements of the current standard specifications for portland cement adopted by the American Society for Testing Materials and this Institute (Standard No. 1). It should be stored in a weathertight structure with the floor raised not less than one ft. from the ground. Cement that has hardened or partially set should not be used.

Aggregate:—Before delivery on the job, the contractor should submit to the engineer a fifty (50) lb. sample of the aggregates proposed for use. These samples should be tested and if found to pass the requirements of the specifications, similar material should be considered as acceptable for the work.

Fine Aggregate:—(a) Fine aggregate should consist of natural sand or screenings from hard, tough crushed rock or pebbles clean and free from any surface film or coating and graded from fine to coarse particles passing, when dry, a sieve having four (4) meshes per lin. in. Fine aggregate should not contain injurious vegetable or other organic matter as indicated by the Clorimetric Test, nor more than seven (7) per cent by volume of clay or loam. Field tests may be made by the engineer on fine aggregate as delivered at any time during the process of the work. If there is more than seven (7) per cent of clay or loam by volume in one (1) hour's settlement after shaking in an excess of water, the material represented by the sample should be rejected.

Colorimetric Test:—(b) The Colorimetric Test may be applied in the field as follows: Fill a twelve (12) oz. graduated prescription bottle to the four and one-half (4½) oz. mark with the sand to be tested. Add a three (3) per cent solution of sodium hydroxide until the volume of sand and solution, after shaking, amounts to seven (7) oz. Shake thoroughly and let stand for twenty-four (24) hours. The sample should then show a practically colorless solution or at most a solution not darker than straw color.

Coarse Aggregate:—Coarse aggregate should consist of clean, hard, tough, crushed rock or pebbles graded in size, free from vegetable or other organic matter and should contain no soft, flat or elongated particles. The size of the coarse aggregate should range from one (1) in. down, not more than five (5) per cent passing a screen having four (4) meshes per lin. in. and no intermediate size should be removed.

Mixed Aggregate:—Crusher-run, stone, bank-run gravel or mixtures of fine and coarse aggregates prepared before delivery on the work should not be used because the ratio of fine to coarse material varies so widely as to lead to concrete mixtures of greatly varying proportions.

Water:—The water should be free from oil, acid and injurious amounts of vegetable matter, alkali or other salts.

Proportions

Unit of Measure:—The unit of measure should be the cu. ft. Ninety-four (94) lb. (one sack or one-fourth barrel) of cement should be assumed as one cu. ft.

Proportions:—The concrete should be mixed in a proportion by volume not leaner than one (1) sack of portland cement, one and one-half (1½) cu. ft. of air dry or the equivalent of fine aggregate and three (3) cu. ft. of coarse aggregate.

Note:—The proportion of fine aggregate should be on the basis of air-dried material because of the bulking of damp sand.

Measuring:—The method of measuring the materials for the concrete, including water, should be one which will insure separate and uniform proportions of each of the materials at all times.

Mixing

Machine Mixing:—(a) All concrete should be mixed by machine in a batch mixer of an approved type equipped with suitable charging hopper, water storage and a water measuring device which can be locked.

(b) The ingredients of the concrete should be mixed to the required consistency and the mixing continued not less than one and one-half (1½) min. after all materials are in the mixer. Including water, and before any part of the batch is discharged. The mixer should be emptied before receiving materials for the succeeding batch. The volume of the mixed material used per batch should not exceed the manufacturer's rated capacity of the drum.

(c) In no case should aggregates containing frost or lumps of frozen material be used.

(d) The mixing plant should be of sufficient capacity and power to carry out each prearranged operation without danger of delay during the process.

Consistency:—The quality of water used in mixing should be the least that will produce a plastic or workable mixture which can be worked into the forms and around the reinforcement. Under no circumstances should the consistency of the concrete be such as to permit a separation of the coarse aggregate from the mortar in handling. An excess of water should not be permitted as it seriously affects the strength of the concrete and any batch containing such an excess should be rejected.

Retempering:—The retempering of mortar or concrete which has partially hardened, that is, remixing with or without additional materials or water, should not be permitted.

Depositing

General:—(a) Before beginning a run of concrete all hardened concrete or foreign material should be completely removed from the inner surfaces of all conveying equipments.

(b) Before depositing any concrete, all debris should be removed from the space to be occupied by the concrete, all steel reinforcing should be secured in its proper location, all forms should be thoroughly wetted except in freezing weather unless they have been previously oiled and all form work and steel reinforcing should be inspected and approved by the engineer.

Handling.—Concrete should be handled from the place of final deposit as rapidly as possible and by methods of transportation which would prevent the separation of the ingredients. The concrete should be deposited directly into the forms as nearly as possible in its final position to avoid rehandling. The use of chutes is not recommended. The piling up of concrete material in the forms in such manner as to permit the escape of mortar from the coarse aggregate should not be permitted. Under no circumstances should concrete that has partially set be deposited in the work.

Depositing:—(a) Where continuous placing of concrete in floor and walls is impracticable, the operations should be in the following order:

1. The concrete of footings and floor.
2. The concrete of walls.
3. The concrete of columns, if any.
4. The concrete of the roof.

(b) No break in time of over forty-five (45) min. should occur during any one operation except between columns and supported roof slabs where six (6) hours should elapse to permit the settlement of concrete in the columns. In placing concrete in floors, it should not be allowed to set up on exposed vertical faces where work is temporarily discontinued. Column footings should be placed monolithically with floor and the floor reinforcement so designed as to distribute the column load over a sufficient area.

(c) In walls the concrete should be placed in layers or not over twelve (12) in. for the entire wall so that a monolithic structure will result. The concrete should be thoroughly worked around the reinforcing material so as to completely surround and embed the same.

(d) If the placing of concrete is unavoidably interrupted by accident or otherwise, the previous surface should be roughened and washed clean with a hose, a mixture of 1:1 mortar slushed on uniformly before further concreting is done and the new concrete deposited immediately thereafter.

(e) When deposited in the forms, concrete should be thoroughly spaded against the inner and outer faces of the forms so that it will densely compact and force out the trapped air and work back the coarser particles from the face of the forms. More and better work can be accomplished by using light wooden sticks one by two in., planed smooth with sheet steel blade at lower end rather than with heavy spades. Enough laborers should be employed, spading continuously to obtain satisfactory results.

Depositing Concrete During Freezing Weather:—During freezing weather, the stone, sand or water or all three materials should be heated so that the concrete mixture will have a temperature of at least 60 degrees Fahrenheit. After concrete is deposited, precaution should be taken to prevent freezing for at least forty-eight (48) hours. Concreting should not be begun when the temperature is below 15 degrees Fahrenheit.

Finishing

The floor and roof should be brought to grade with a straight edge or strike-board, finished with a wood float and troweled to a smooth surface as soon as possible after the concrete is deposited. Voids in walls, if any, should be filled with a one to one and one-half (1:1½) mortar as soon as the forms are removed. After filling these void spots they should be rubbed smooth with a fine grained carborundum brick.

Forms

Material:—The forms should be of good material planed to a uniform thickness and width, tongued and grooved for walls, strongly made and located or held in place by exterior bracing or on the outside of circular walls by circumferential bands so that no distortions allowing displacement of concrete will be possible.

Workmanship:—Joints in forms should be tight so that no mortar will escape. All forms should be oiled and if forms are to be re-used, they should be thoroughly cleaned and re-oiled. (A slush mixture of one-half petrolatum and one-half kerosene makes a good mixture for oiling forms.) The use of bolts or wires through the concrete should be prohibited. All spreaders should be removed.

Removal:— The forms should not be removed until the concrete has sufficiently hardened so that no deflection or damage will result. In warm weather column and wall forms should remain undistained for at least forty-eight (48) hours and roof forms at least seven (7) days. In cold weather no predetermined rules can be made, but should be left to the judgment of the engineer in charge.

Sliding Forms:—Contractors equipped to handle the work with sliding forms may be permitted to do so provided the forms are left at one level until the concrete which will be exposed on raising them has hardened sufficiently to sustain the weight of the concrete above.

Details of Construction

Joints:—(a) Unless the roof is insulated against temperature changes by sufficient earth cover or the reinforcing in walls and roof is designed to take care of temperature stresses likely to occur, an expansion joint should be provided between the tops of walls and the bottom of roof slabs so that any expansion of the roof due to temperature changes will not transmit bending moment into the walls.

(b) In roof slabs where temporary stops are necessary, they should be made on the plane of least shear, that is; at the middle of beams or slabs.

(c) If walls and floor are not deposited in one operation an approved joint or dam should be provided between the floor and walls. It can be made as follows: (1) provide a recess in the floor to engage the wall and insert a galvanized iron strip at least ten (10) in. wide with joints riveted and soldered so as to form a continuous band on one side of the recess, or (2) place a ten-in. strip of deformed sheet metal one in. back from the inside form and engaging floor and wall equally. After wall form is removed the 1 in. recess is to be plastered with a 1:1½ mortar to make a 6-in. coved base.

Treatment of Concrete Surface:—The interior of the tank should be oil-proofed. This work should be done only by persons familiar with this process. A bond guaranteeing the work for a term of years should be furnished.

Note:—Oil-proofing is deemed essential owing to the possibility of using the tank as a container for oils of various characters.

Water Test.—The tank should be tested as soon as practicable in the opinion of the engineer by filling with water, and should show no signs of leakage during a period of seven (7) days.

Service:—The tank should not be placed in service until after the engineer in charge of the work is assured that the concrete has gained sufficient strength to resist all involved stresses.

Backfilling:—Backfilling should not be done around the walls nor deposited on the roof until after the water test has been made and at such a time when in the opinion of the engineer in charge, it can be safely done.

Protection Against Lightning:—All steel reinforcement should be interconnected and grounded by an approved method as a protection against lightning. Any pipe passing through the tank should be properly bonded to the reinforcement.

Venting of Tanks:—(a) An independent, permanently open galvanized iron vent pipe terminating outside of building shall be provided for every tank. The lower end of the vent pipe shall not extend through the top into the tank for a distance of more than one inch.

(b) Vent openings shall be screened (40 by 40 non-corrodible wire mesh or its equivalent, preferably cone shaped) and shall be of sufficient area to permit power inflow of liquid during the filling operation and in no case less than one and one-quarter (1¼) in. in diameter. Screens shall be accessible for examination and removal. Vent pipes shall be provided with weatherproof hoods, and terminate twelve (12) ft. above top of fill pipe, or, if tight connection is made in filling line, to a point one (1) ft. above the level of the top of the highest reservoir from which the tanks may be filled and preferably not less than three (3) ft., measured horizontally and vertically, from any window or other building opening.

Filling Pipe:—End of filling pipe in tank shall be turned up so as to form a trap or seal, and when installed in the vicinity of any door or other building opening shall be as remote therefrom as possible so as to prevent liability of flow of oil through building openings; terminal shall be outside of building in a tight, incombustible box or casting, so designed as to make access difficult by unauthorized persons.

Manhole:—Manhole covers shall be securely fastened in order to make access difficult by unauthorized persons. No manhole should be used for filling purposes.

Oil Level Indicating Device:—A test well or gaging device shall be installed and so designed as to prevent the escape of oil or vapor within the building at any time. The top of the well shall be sealed and where located outside of building, kept locked when not in use.

Pipefitting:—All pipes shall pass through the roof, if possible. If necessary to pass through the walls, there should be flanged sections with a space of about one and one-half (1½) in. left between the flange and the concrete on each side of the wall; this space should be calked later with litharge and glycerin or other approved oilproof material. It is advisable also to have a ring projecting about two (2) in. around the pipe sleeve which engages the concrete.

Care of Surface Water:—(a) In many cases it becomes necessary to construct reinforced concrete tanks in localities near tidewater, rivers, streams or water basins where water pressure may be derived through porous soils. Care should be taken to keep this water pressure from fresh concrete until it has attained sufficient strength to fully resist the assumed hydrostatic pressure.

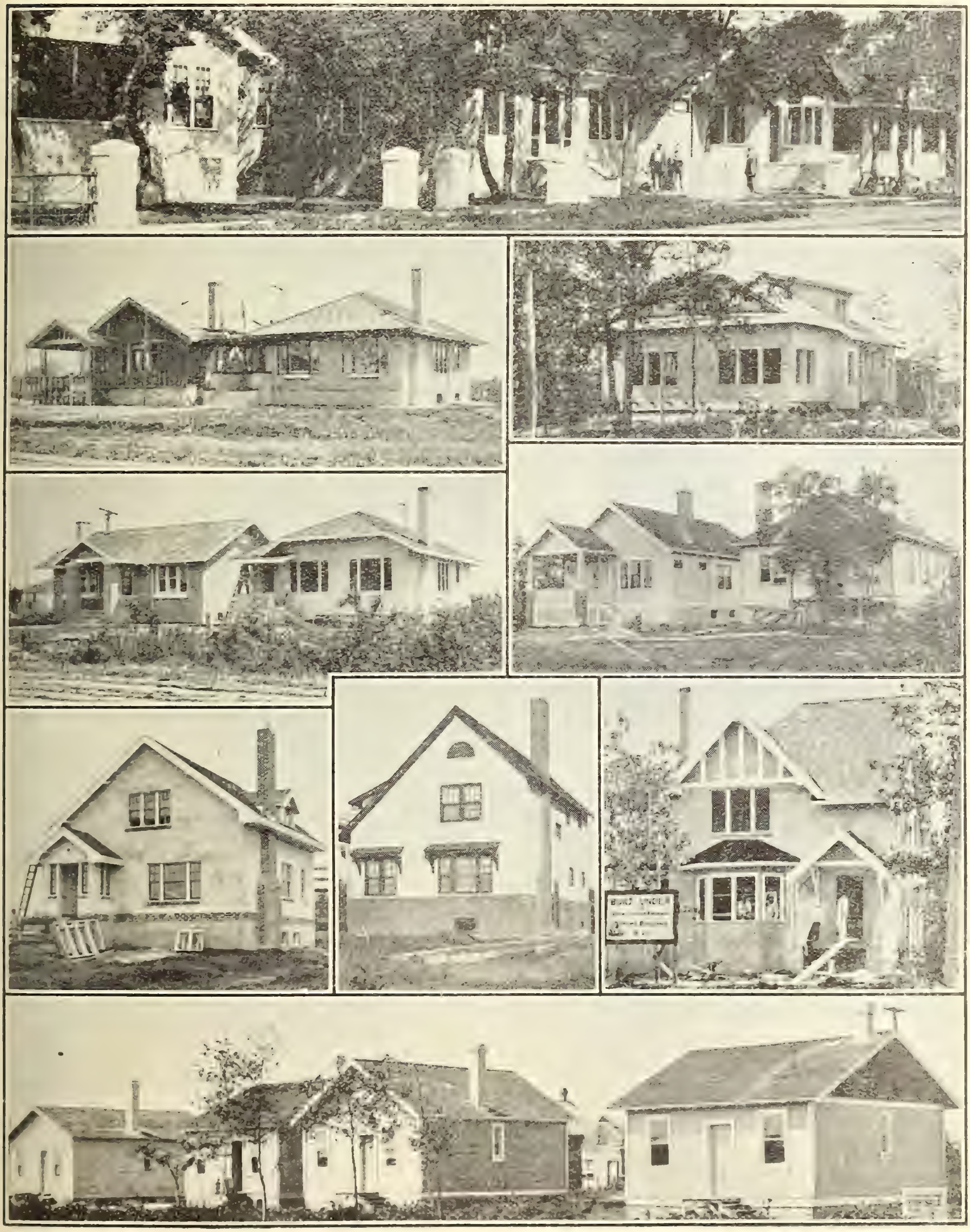
(b) If it becomes necessary to sheet-pile or shore the tanks, the shores should be so designed that they will not pass through the walls and thus leave openings that it would be necessary to fill later.

Cleaning Out Tanks: Warning:—It is dangerous to life to enter fuel oil tanks soon after they are opened as there is not only danger of suffocation from oil fumes on account of the absence of sufficient oxygen, but an explosion may be caused by the accidental presence of an open flame in the vicinity. Before entering the tanks should therefore, be freed from all inflammable vapors.

New Company

L'Enterprise Generale, Limitee, d Riviere-du-Loup, with building materials of all kinds and to carry on a building head office at Riviere-du-Loup, capital $20,000, to deal in business.

Some Typical Houses Built in Winnipeg in Recent Months



Bituminous Concrete and Penetration Surfaces for Roads

Practical Methods for the Construction of Roads of These Kinds—The Relative Merits of the Hot Mix and Penetration Types —Discussion on Curb Design

By E. A. JAMES
Engineer, Toronto and York County Highway Commission

Before the Conference of Ontario Road Engineers and Superintendents

For the purpose of this discussion I prefer reversing titles and naming the paper "Penetration Surface and Bituminous Concrete." For while the future may develop processes of construction that will make it possible to construct penetration surfaces that as a class are superior to hot mixed surfaces, in the present state of the art I believe our hot mixed surfaces are of a superior type. I must also add that I do not advocate the use of bituminous concrete to the exclusion of penetration surfaces. But on the other hand I believe today we are laying penetration surface and vice versa.

Mr. E. A. James

I take it that each subject in the agenda is complete in itself but as an introduction may I refer very generally to one or two features in connection with pavements.

As paving engineers we appear to be satisfied as to road design and the road cross section and our investigations are now confined more frequently to foundations and wearing surface.

Foundations

Any foundation that is suitable for bituminous concrete is in my opinion suitable for penetration surface but the converse is not true. A paper on foundations will deal with the type, thickness and method of construction, but it is within the province of this paper to deal with the surface of the foundation, because the wearing qualities of the surface depend in a marked degree upon the bond between the surface and the foundation.

If it is an old macadam foundation the road should be swept but I have no objection to leaving on the old macadam surface live bitumen that may have adhered from surface treatment, provided that it is uniform in its application. If it is not uniform and exceeds one third of a gallon to the square yard it should be removed, otherwise there is a danger of the bitumen from your surface penetrating and cutting back the tar of the old surface treatment to such an extent that you will get excess tar and therefore movement in certain patches of your new road. If, however, the tar from former surface treatment is reasonably uniform, in applying your new penetration you can make allowance for this. When building new macadam base for penetration surface we sweep the base until the body stone project. We are of the opinion that many penetration roads have been ruined by leaving a film cake of fine lime between base and surface course. If it is an old brick road which is being surface treated, great care must be taken in evening up the brick surface with a lean mix of stone and bitumen. This filling will be carried on until you have a road camber which you will permit of a uniform thickness in the wearing surface.

A concrete base should be left rough. Our preference is for raking it with a wooden rake at right angles to the line of traffic. The marks left by the rake should be approximately one half inch wide, one half inch deep and four and a half inch centres. With such markings, rolling of the penetration surface keys the material and even with excessive bitumen there is very little danger of movement.

For bituminous concrete when old base is being used much greater care must be exercised than with surface penetration.

From our experience in laying hot top during the last four years I have been forced to the conclusion that it is bad engineering to lay hot top unless a curb has been constructed. I have tried shoulders, hoping in this way to prevent any side movement in the hot top surface but so far we have failed. There should be no excess bitumen in hot top and just as sure as you get side movement you get a perceptibly weaker pavement. This criticism does not apply to the penetration surface because we know the penetration surfaces carry excess bitumen and little openings are immediately healed in warm weather.

We are, therefore, of the opinion that hot top on a macadam base is a type of construction that will not be continued, unless curbed.

Where curb and gutter are constructed it is necessary that the macadam base be swept absolutely clean and this base must not be an old bituminous base unless you are satisfied that the bitumen is less than 4½% of the base. In other words the usual penetration macadam must not be used as a base for hot top.

If it is used you will find the bitumen in the base will cut the bitumen in the surface and a rolling, soft pavement will result.

A concrete base should be left rough no matter whether you use close or open binder. It costs but little and it adds materially to the life of the pavement. In the case of the hot top the markings, if with a rake, should be made both ways but not so deep as for penetration but at about the same centres. One of the best markers we have used is a coil of rope fastened to a tamper. The surface is stamped before the concrete has taken on such a set as will interfere with the strength of the base.

Creeping

By far the greater percentage of creeping is due to the lack of bond for the base and wearing surface. A comparatively thin wearing surface, not bonded to the base, develops both temperature and traffic stresses that cause the wearing surface to move. Rolling and cracking follow and the pavement disintegrates. In the mixture itself uniformity in the raw materials is an essential. Variation in the percentage of contents must only be permitted within small limits as carelessness or ignorance in proportioning the mixture is without doubt, the greatest cause of failure, in bituminous concrete pavements.

In connection with mixing, care should be taken to prevent unmeasured asphalt to get into the mix.

Asphaltic Concrete

Asphaltic concrete is to my mind one of the most uncertain of the hot top surfaces. Even with care you will find such a variation in pavements throughout one day that you are forced to the conclusion part of the pavement is good and part bad. For this reason we are not as enthusiastic over this type of pavement as we were four years ago. Today we would not allow this type of pavement at all unless we were assured that the rock used would be trap and even then we would hesitate.

Any change that we have made recently in sheet asphalt has been to increase the binder, which is a close binder, using a thinner wearing surface. We think that the binder serves two purposes, one to prevent slipping on the base and the other to distribute the load over a greater bearing surface. If for any reason one half inch of the wearing surface is removed the pavement should be repaired even if the wearing surface is one inch and a half. So our preference is for a three inch pavement, two inch base and one inch wearing surface.

Laying the Top

Of course, the material should be brought to the work at the proper temperature and then proper raking and spreading are essential. Of the many mechanical processes in connection with paving, raking is one of the most important and yet most difficult for some to accomplish successfully. It appears to be an art in itself.

While a good raker is important, an experienced rolling man is also essential. The temperature at which it may be rolled, the direction and intensity of rolling, are matters of judgment which can not be definitely set by specifications.

Penetration Macadam

In penetration pavements the selecting of the stone is very important. Our experience has shown that a uniform 2″ stone is to be used. A stone that breaks cubically will allow of greater penetration than a stone that slivers. The first keying should be done with ¾″ and the keying finished with ⅜″ stone.

I noticed in a recent inspection of British road construction that the better penetration roads are hand poured. The resident engineers claim that they can get a more uniform penetration because there is not consolidation from the wheels of the trucks and if, for any reason, small areas become consolidated it is easy to rake them so as to secure sufficient penetration. On our work we find, however, it is almost impossible to get men who are willing to hand pour bitumen, so that with our mechanical appliances our first care is to prevent uneven consolidation. We never allow the tar trucks to pass along the loose stone under their own power. We haul them with the road roller. We also keep a man with a rake working just ahead of the spray to make sure that foreign substances are removed and consolidation in the stone loosened. We use hand nozzle and prefer it to the manifold. No matter what care is taken with loading the bitumen in the manifold we find stoppage under the individual sprays that leave weaknesses in the road. We have not had much difficulty in the training of men to handle nozzle as after a man with judgment has completed a couple of tanks he knows from the color of the mat approximately the quantity he has applied.

After the first application of bitumen, which we usually make slightly over a gallon per square yard, we add three quarter stone and roll until there is no movement. This rolling usually leaves a film of dust which we broom from the surface and add a second application of slightly more than a half gallon covering it with three eighth chips, rolling and sweeping until the mat is formed and the road water proof.

We then throw the road open for traffic and either that season or in the succeeding season apply a coat of light bitumen which we cover with very coarse sand or pea gravel. Even on the heavy traffic roads our experience is generally that it is three years before further attention is required and then an application of one quarter of a gallon per square yard of light bitumen appears to make the road as good as new. We have not had success with coarse rolling on our penetration roads. Commencing at the edge and working to crown on longitudinal rolling we find a better practice.

Bituminous Concretes

Under the head of bituminous concretes we include all hot mix tops. Pages might be written in connection with the specifications for this type of pavement as there are so many variations in size and character of stone and sand and in the course of bitumen that may be used that one almost finds it impossible to classify pavements even for the purpose of comparison. While general rules may be laid down as to percentages of bitumen and percentages of the various sizes of stone and sand, yet variations with these limitations are sufficient to make a difference between good and bad pavements.

Conclusion

So long as roads are being built the discussion will continue as to which is the better type of pavement and as a man succeeds or fails with a particular type it is likely to be found that the type which he has been successful with will be his ideal for the moment. From the service and economic point of view we think we have been very successful with water bound macadam and even in the County of York for some years to come water bound macadam roads will represent the greater mileage, but of the more expensive paving we favor reinforced concrete base with a bituminous top, a base bridging the soft spots and distributing the road, the wearing surface of bitumen taking up the impact giving a quiet, resilient wearing surface. Where the conditions are such that this wearing surface must be washed to prevent the dust looseness, hot mix must be used, but the penetration surface will not stand scouring. In the open where the wind and storm keeps the road clean, dollar for dollar the well built penetration road will give as good results.

Discussion

Mr. Muir opened the discussion, stating that, unfortunately, this type of surface is not adaptable to the narrow gravel road, of which there is so great a mileage throughout the province, the tendency being for the surface to spread on a narrow road. He advocated careful inspection, where such type of surface is laid, to see that the materials are mixed and heated properly, and also the selection of a uniform size of stone, instead of a mixture of 2 inch, 1½ inch and 1 inch sizes. He also preferred the use of a hose for spraying in preference to the distributor. The sunken curb as a means of preventing spreading of the surface was referred to by the speaker, Mr. James remarking that 1,000 ft. of this curb is being tried as an experiment on one of his roads this year. One possible objection to the sunken curb was raised by a member, he stating that there might be a tendency to heave with the frost. Mr. McLean stated the experience of the department in the construction of this type of curb ,where a concrete base was utilized, was to consilidate it with the base, the road metal being laid in the centre, thus obviating any danger of curb heaving by frost action. The danger of having curb chipped off by the roller was brought up, but Mr. James stated he did not anticipate any trouble in this connection provided the curb is laid well under the surface of the top material and providing the operator of the roller exercises the necessary precautions.

Heavy Haulage in Highway Construction

A Discussion of Transportation Methods as Used by Road Contractors—Where Can the Heavy Truck be Used to Advantage?—The Problems the Highway Builder has to Face in Handling His Hauling

By CHAS H. FRY
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Before the American Good Roads Association

The title of this paper implies a certain amount of what is a foregone conclusion in regard to preference for heavy duty trucks for haulage purposes in connection with highway construction, particularly when presented by an author whose experience has led him into favoritism for this type of hauling equipment. Notwithstanding, this paper is presented with a full understanding that experienced and well informed minds often differ on the subject of methods.

Irregardless of the methods employed, several standard methods having gained preference among various highway constructors in various sections of the country, we are, however, allowed to assume that the road constructors and the equipment manufacturers and distributors are all determined upon one definite objective, i.e., production progress with the least necessitated amount of waste—waste capital (investment), waste labor, waste material, waste efficiency, waste what not. In the last analysis, we aim for the minimum cost per unit of laid concrete, excavated or filled earth or rock.

The proposition which concerns the readers of this paper in their everyday experience with the trade, is what method attains the common objective and proves itself superior over all other methods? This is a question not easily answered.

Therefore, in the presentation of this paper, the author desires to draw attention to those determining factors, which, in his estimation, have governed his management in the selection of the heavy duty truck for haulage. The author confines himself to a discussion on haulage equipment serving in the construction of macadam, gravel, "stone," and concrete roads.

Variety of Roads

The natural sand-gravel roads such as abound on and near those flat plateaus surrounding and adjacent to the Great Lakes, as well as similar natural roads found in other sections of our country, also the rock formation forming the sub-base for so many of the roads in the mountainous districts, without a doubt, serve best for permitting the utilization of the heavy duty truck. This type of sub-base permits the early escape of water from rainfall and consequently discourages layup of heavy duty trucks at times when saturated clay and muddy roads would necessitate costly loss of time from continuous operation. Such a factor has contributed toward making the author a heavy duty truck enthusiast when possibly a highway contractor in some other section of the country would favor a different method.

One point to consider in this connection is—in how large an area of our country can the heavy truck be utilized to distinctive advantage? The factors to be considered in this paper point the way to a comprehensive survey. Recent charts compiled and edited by the Associated General Contractors of America, showing the seasons of the year suitably and practically adapted and in force for road construction purposes in the various localities, will serve as a guide in reaching a conclusion.

Hauls

Closely related to the foregoing and hardly less important is the subject of hauls. Obviously the only ones to be considered are short and long hauls. Other things being equal, the advantage is constantly growing in favor of heavy duty trucks because of the increasing tendency toward longer hauls.

The long haul, utilizing heavy trucks, reduces the amount of field supervision such as is necessitated when fleets of small trucks are on the road. One striking advantage in operating fewer units is the obvious absence of contributing causes toward units getting in the way of one another. Simple though it may seem, this is a very important consideration in the hills and in mountainous country. The long haul manifests the advisability of heavy units, particularly when taking into consideration the availability of experienced and dependable labor.

Co-ordination

We cannot intelligently discuss haulage characteristics and requirements without taking fully under advisement the correlated equipment and special appliances which are utilized in the other operations. Like all industries, which, in their pioneer days, were hampered and delayed from time to time because of inadequate facilities and lack of improved equipment, so was the road construction industry handicapped in its early days. Of late years, however, the road construction industry has been the beneficiary of many improved types of equipment, so that instead of becoming impoverished because of neglect or indifference, we find ourselves today reinforced along every avenue of exertion by improved and, in numerous instances, highly developed and patented road building appliances. These have been devised to ameliorate the obstacles long contended with. The equipment manufacturers have proven themselves practical students of a stupendous industry as is testified to by the numerous dependable types of labor-saving road construction equipment now on the market.

We have both ends of the haul to consider, not ignoring the requirements that demand attention between the two extreme points of operation. Between the measuring and striking off points and the unloading point at the paver skip, the heavy duty truck stands as a supreme testimony of efficiency. As the old adage goes, "An early start is half the race."

Gliding into position under an improved and latest design measuring and striking off hopper, a heavy duty truck stops for the fractional part of a minute, swallows its load of four standard six bag batches of aggregate and is off on the last leg of the journey in no more time than is required to do the same thing with one batch only on a light truck. And when the big truck arrives at its destination, backing into the paver, the fewer the trucks, the less the disturbance along the way and at the paver itself.

Maintenance

Without entering into an analysis of pure cost data or summarizing along this particular vein, there are outstanding merits in favor of heavy trucks along lines of operation and maintenance.

The restricted labor supply of the past warrants the conclusion, comparatively speaking, that a few dependable and seasoned truck drivers of known qualifications form an operating force far superior to a larger force of doubtful personnel.

In this connection, it is known that heavy trucks are slower than light trucks, nevertheless, there is apparently an advantage in wear and tear. It appears that the heavy truck stands the vicissitudes of operation to more marked advantage—the rugged frames, the heavy wheels, the big tires, the staunch bodies, as well as the enlarged members of motor, driving and transmission machinery, the ability to take punishment, seem to stand the gaff and are readily amenable to satisfactory overhaul. The great strong, dependable units take their place admirably in helping to weave the cloth of progress.

Flexibility

When the contractor finds himself in the market for the purchase of transportation equipment, without a doubt he finds himself dealing with the most complex problem of road building. To arrive at any decision he must consider so many details that in the end he generally feels that he has reached only the experimental stage. There is a constant and inviting incentive to attain the best results. In touching some of the major problems consider first the investment. The expenditure for any type of hauling equipment is the largest item of the contractor's plant. This fact alone should cause the contractor to choose the most flexible equipment.

In the selection of motor haul equipment the road constructor must be governed by the various requirements which will manifest themselves from time to time during the progress of his management. When he considers that he will be forced from time to time into competitive bidding upon all kinds of road contracts presenting multifarious conditions, the contractor, of necessity, must plan upon a suitable degree of flexibility. Heavy duty trucks provide for this flexibility that cannot always be provided for under other methods.

Other Determining Factors

Heavy trucks provide general adaptability. Even in seemingly unimportant ways, they are adaptable. In storage alone they require less space during lay up and during idle time. Innumerable times they serve to manifest an indisputable advantage in towing other types of equipment. They augment the facility with which the general equipment is moved on and off the job. In the matter of grades, experience has proven that the heavy unit will pull up and take any grade that the light unit can negotiate.

In the matter of sub-base, the greatest argument against heavy trucks seems to have been accusation that the sub-base was subject to an excessive amount of cutting up; but experience substantiates the contention that when sub-base conditions are at all favorable, the big trucks with their wide tires iron out the sub-base and pack it down like a roller. From the standpoint of public interest this provides a more substantial job.

In summarizing the elements of this paper, the author, has endeavored to point out the main factors which through analysis have placed him in the position of a heavy truck enthusiast.

He has been favored with the privilege and opportunity to operate and study different haulage methods, more or less of the time, of course, in a locality and at seasons of the year well adapted for the utilization of heavy units. And he has no argument with other contractors who may have a cherished method altogether different which may be entirely laudable and entirely adequate for the conditions encountered.

Can Concrete Houses be Popularized?

The Lack of Builders Who Are Experienced in Erecting Houses of Concrete is Detrimental to Their General Approval—Construction Details and How They Are Carried Out in Concrete

By J. C. PEARSON
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For convenience I shall refer frequently to the all-concrete house, meaning by this a house which has its structural walls, floors, and main bearing partitions of concrete, regardless of other materials which may be used in the exterior or interior finish. The outstanding advantages of such a house are four:

1. It is more sanitary than any other type affording less opportunity for vermin to find thoroughfare or breeding and hiding places.
2. It is a very fire-resistive type of construction.
3. Its maintenance and depreciation are low.
4. It is of maximum stability and rigidity.

These advantages are fairly self-evident and I have no comment to make on the first, nor on the second, other than to mention the regretable fact that our people are so indifferent to fire risk. Fire-resistive construction in dwelling houses is inseparably a part of the new order of building; in the all-concrete house we can have the highest degree of fire resistance.

Low Depreciation

The average person may, however, be less impressed by the usual arguments for fire-resistive construction than by a few simple figures which illustrate the meaning of reduced maintenance and depreciation charges. It is fairly well established that a proper maintenance and depreciation allowance for frame houses is about 5 per cent per annum of the total cost. An all-concrete house, we are led to believe, can be built at a cost not greater than 15 or 20 per cent above that of a frame house on substantially the same plans, and the maintenance and depreciation allowance on this type is estimated at about 2.5 per cent. Neglecting taxes and insurance, which about offset each other in these two types, the annual carrying charges for the frame house are interest, say at 6 per cent, and maintenance and depreciation, 5 per cent, total 11 per cent. For the concrete house the charges are 6 per cent and 2.5 per cent, or 8.5 per cent. Assuming the cost of the frame house at $5,000 and the concrete house at $6,000, the annual carrying charges, exclusive of taxes and insurance, are $550 and $510 respectively. Thus the more expensive house proves to be the better investment, for the annual savings, although small, are sufficient to offset the increased first cost in about 16 years, or slightly less than the period set by many building and loan associations for repayment of building loans. If the difference in the first cost had been 15 per cent in the example given, the period necessary to offset this amount by the annual savings in carrying charges would be less than 10 years. The thought I wish to emphasize here is that the first cost should not be the determining factor in the purchase or building of a home, and that if one were required to pay 25 per cent more for an all-concrete house he would find it a better investment in the safety, comfort, and satisfaction of living in a home that was practically safe from fire, and free from many of the faults that develop in the ordinary house.

The fourth argument for the concrete house, maximum rigidity and stability, is a most important one, for these are the qualities upon which low maintenance and depreciation depend. Rigidity and stability of the frame do more than this, however, for they not only tend to preserve the house in its original condition, but they save the house owner and house keeper from continual worry about the unsightly appearance of cracks in the plastering, the separation of baseboards from floors, the annoyance of sticking and non-latching doors, sags and humps in floors, and other ills of like nature.

Arguments Against the Concrete House

There are certain disadvantages of the concrete house which we must recognize at the present time, even though they are not all to be regarded as such in the future. Bearing in mind that we are discussing the subject from the point of view of the prospective home-owner, we may list the following objections in the order of increasing importance.

1. Prevalence of opinion that the concrete house is likely to be cold, damp or unattractive in appearance.
2. Higher first cost.
3. Building code restrictions.
4. Lack of builders who are interested or experienced in this type of construction.

The first of these objections is valid only to the extent that one may be unfavorably impressed by certain existing examples of concrete housing which, in the endeavor to find a place in a cheap competitive market, have suffered from the omission of essentials, not only in finish, but also in proper wall insulation. The problem of insulation is not different from that of any masonry house, and in fact there are several systems of concrete house construction which provide the necessary insulation within the wall, a provision which is not as successfully and easily accomplished in any other type of rigid construction. It is true that there are many ugly examples of concrete houses, but the most of these are to be found in commercial and industrial housing projects, where pleasing finishes are deliberately sacrificed to cheapness and utility. The first objection is, therefore, not founded upon fact, and does not need to be seriously considered. A concrete house may be made as attractive as any other, and in fact has possibilities of its own for distinctive treatment.

The second of these objections, higher first cost, is unfortunately too often the deciding factor in the building or purchase of a home. It has been shown, however, that the additional expense entailed in building with concrete is a wise investment, as it means a saving in the end and carries always certain

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Abstract of a paper read before the American Concrete Institute [illegible] advantages in the nature of a direct return. The higher cost is not, therefore, a valid argument against the concrete house, for it is the justifiably higher price of a better product. But there is a real objection to higher first cost when this includes a premium upon the ignorance or inexperience of the builder. This is a condition which has to be faced during the introduction of new methods and processes in building, and we must recognize that too high first cost is a real obstacle to building these better concrete houses.

Present building code restrictions are in many cases a very serious handicap upon concrete houses, especially those of the monolithic type. Until changes are generally introduced, the concrete house will be handicapped by traditional requirements which have been imposed upon older and inferior types of construction.

Builders Are Inexperienced

The greatest disadvantage of the concrete house at the present time is that comparatively few builders have had any experience in building houses of concrete. The majority of small builders will not take the initiative in this matter, and will wait for a general demand to be created before they become sufficiently interested to inform themselves regarding efficient methods, but I believe it is ultimately through the efforts of progressive builders, and not through promotors, that the concrete house will come into general use. The architect will also contribute his share in this development, but it is the associated architect and the builder who will eventually solve the individual concrete house problem. We have the basis for a great many possible solutions to this problem in the multiplicity of "systems" of concrete house construction, but none of these can be accepted as a real solution until it has been thoroughly tried out and kept going with increasing momentum for a period of years.

Construction Methods and Problems

To get the full benefit of concrete in house construction it is desirable that walls, floors, and at least the main bearing partitions be built or framed in concrete. At first this sounds somewhat radical, but we are well aware that larger structures such as hotels, apartments, and public buildings are economically built of reinforced concrete, and there is no reason why this same sort of construction cannot be extended to small structures, such as dwelling houses. This has been done successfully in large operations, but in very few cases extended to individual homes. One of the chief reasons for this state of affairs is that special equipment and knowledge are required by the builder, if good concrete houses are to be built at a sufficiently low price to create a general demand. At the present time there seems to be more equipment available than knowledge, but neither equipment nor methods have been worked out on sufficiently broad lines to indicate clearly how the individual concrete house will eventually be built. The intrinsic merit and superiority of the all-concrete house warrant, it seems to me, encouragement of effort not only on the further development and standardization of this type of construction, but on a broad program of research and education, in order that the product may become more generally available at a cost which will be attractive to people in moderate circumstances.

In the face of many difficulties in selling the all-concrete house, we see many promotors of concrete construction making more or less headway with houses constructed partially of concrete, in which the particularly expensive item of structural concrete floors is omitted and the concrete in most cases confined to the exterior walls. While the concrete-walled house lacks much of the intrinsic value of the all-concrete house, the gradual introduction of the latter may perhaps best be brought about by getting the public accustomed to the idea of the cheaper concrete houses and eventually to the general acceptance of full-fledged concrete houses in this manner.

The Fire Hazard

With particular reference to the concrete-walled house, whether it be of the small unit or monolithic type, a warning should be sounded against overrating either the fire-resistive quality, or the expectation of low maintenance and depreciation, if the interior framing is of wood. A very large proportion of all fires originates on the premises where they occur, about 95 per cent of the entire number, I believe, or about 83 per cent on the basis of the total fire losses. The mere fact of an exterior wall of concrete or masonry does not, therefore, have much effect on the fire hazard in a dwelling house, although liability of total loss may be lessened thereby. Insofar as maintenance is concerned exterior walls of concrete reduce the cost of exterior painting considerably, but if the interior framing, particularly of the main bearing partitions contains any appreciable amount of horizontal wood, the plastering and the general interior condition are likely to be in worse shape after a round of seasons, and at all times subsequently, than in a well-built frame house. It is most important, therefore, in building the concrete walled house, to take all the precautions for fire protection of the interior that are recommended for wood-frame houses, and to make special effort to eliminate horizontal wooden supports in the bearing partitions. If specifications for concrete-walled houses include the additional requirement that main bearing partitions shall be similar to the exterior walls, or of equally rigid construction, the interior of such houses will be maintained in better condition than will be possible if the interior framing is entirely of wood.

Walls

The ordinary concrete wall, whether monolithic or of the small unit type, needs insulation of some sort, even in moderately severe climates. The most common practice is to fur with wooden strips and lath and plaster the interior. Certain types of concrete block are designed to give a continuous air space and this avoids the necessity for furring and lathing. The same result is accomplished by the monolithic double wall, and so far as our present information goes, any type of wall that presents two air-tight layers of solid material separated by an air space offers a sufficient barrier to the passage of heat to make an acceptable dwelling house wall. If these layers are connected by webs or cross ties of metal, concrete or masonry units, which form any considerable percentage of the wall area, the insulating value of the remaining air space is largely ineffective, hence the necessity for furring and lathing walls of concrete block and tile. In the case of the cinder block or the monolithic cinder concrete wall, a dry pressed or dry tamped mix may be a sufficiently poor conductor of heat to warrant omission of furring and lathing and if at the same time the necessary strength is obtained, this type of construction may afford a double measure of economy. At least one other type of wall is worthy of mention, and that is the thin solid slab lined with a good insulator, such as cork board or fibre board. This method of insulation promises to be economical and effective and if it permits of satisfactory interior finish, which is independent of wall plaster, it will be a strong point in favor of the small monolithic house.

There is little exact knowledge, however, concerning either the absolute or relative heat transmission of different types of walls; the problem of determining this property is much more complex than it appears to the layman. It is hoped that the Bureau of Standards will, within the next two or three years, be able to carry out a comprehensive investigation of this problem, and it is gratifying to be able to report that preliminary tests on a limited number of typical wall sections have already been undertaken, mainly to establish the methods which should be used in carrying out such a series of tests.

Floors

The problem of floors in the concrete house, or in any type of brick or masonry house that is so built as to qualify in the vermin-proof, fire-resistive, low-upkeep class, is the most important and the most serious of any that we have to solve at the present time. Moreover, it is an economic problem entirely, and consequently of greatest importance in its relation to the moderate priced home.

In suggesting the propriety, and from an advanced point of view, the necessity, of putting concrete structural floors into the concrete house, we must recognize the fact that people are accustomed to wooden floors, and until they are educated to a different point of view, will generally demand them. But a concrete slab of standard design, with wooden top floor and a space underneath for pipes and conduits, is a very expensive type of floor, too expensive in fact to go into any but high-priced houses. It is found, however, that the elimination of the wooden top floor and the exposure of a few pipes, which should not be laid in the structural slab, reduce this cost very considerably. Many people have tried the plain concrete floors and find that there is much less objection to them than most people imagine. Rugs and other coverings may be used on the concrete floor with just as much satisfaction as on the wooden floor. Bue even so the standard flat slab floor is too expensive, and if built according to recommended practice affords an absurdly large margin of safety. The reason for this seems to be that present standard design does not apply satisfactorily, that is, economically, to the low-load, short-span conditions prevailing in most dwelling houses. There seems to be something fundamentally wrong with a floor design which involves a dead weight from two to four times as great as the maximum live load the floor will ever be called upon to carry.

Need for Experimental Work

There are two possible solutions for the concrete floor problem. One is that by some ingenious scheme an acceptable design can be found where the forms or the reinforcement, or both, may be made to serve a double purpose. A scheme of this sort was described in the paper by Mr. H. Whittemore Brown before the American Concrete Institute a year ago; but the method used by Mr. Brown would not be generally applicable. The other solution is to thoroughly test out some new designs that promise to meet these special small house requirements. Certainly there are not lacking a multitude of suggestions for such designs. I believe there are a number of ways in which this problem of concrete floors for small houses can be worked out satisfactorily, but after all, what we need is facts, not beliefs, and the sooner these facts are established, the sooner can the small concrete house be built at a cost comparing favorably with that of the frame house. There is nothing more essential than such a series of tests to the building of better houses at lower costs.

In the meantime there is a possible compromise between the concrete floor and the wood joist floor in the use of light weight pressed steel beams. Somewhat more than a year ago I had an opportunity to inspect the steel lumber and stucco house in Canton, Ohio, built by the Berger Mfg. Co. of that city. I was particularly interested in the floor construction, which seems well adapted to any type of concrete house because either wood or concrete top floors can be economically used. The construction which appealed to me as meeting most of the requirements was steel joists of suitable dimensions overlaid with two inches of concrete and protected underneath with metal lath and plaster. If the wood top floor were desired, nailing strips would be fastened to the beams before placing the cinder fill, and the wooden floor nailed in the usual manner. I am indebted to the Berger Mfg. Co. for an estimated cost per square foot of this latter type in place and ready for the wood floor, at 36 cents per sq. ft. This is for a floor of 14-ft. span, carrying a live load of 30 lbs. per sq. ft., the weight per sq. ft. of finished floor being given as approximately 35 lbs. I do not know how extensive the data are on which the performance of these floors is based, but the type should certainly be included in any comparative series of tests.

Partitions

The main bearing partitions of the concrete-walled house should be of rigid construction. The choice would naturally be concrete building units when these are used for exterior walls, but steel or reinforced concrete beams, monolithic concrete or any suitable type of masonry may be selected that will prove most economical for the plans. In the all-concrete house or in the concrete-walled house with rigid main bearing partitions and protected steel lumber floors, minor partitions can economically be framed in wood. Not more than 4 in. of horizontal wood is required for the two nailing plates, and the shrinkage or distortion would probably not be great enough to result in appreciable deterioration. Metal lath is preferable for such partitions, and wood-top floors, if used, should be laid after the partitions are framed in place.

Roofs and Porches

It seems to me that the roof and porches of an all-concrete house, in the sense that I am using the term, need not be constructed of concrete, although concrete can often be used to advantage in both. The point of view is that the chief structural parts of a house cannot be built of better material than concrete, and if the rough structural shell has been properly designed and constructed, the chief advantages that concrete has to offer have been assured. The main purpose of the roof is to protect the dwelling and its occupants from rain, snow, heat and cold, and also to afford an acceptable architectural treatment. Whether the space between the roof and the living quarters is simply an air space or utilized for storage purposes, its construction in wood frame would be entirely consistent, provided it were covered with incombustible roof covering and fire-stopped at the eaves. An added safeguard would be provided by covering the rafters with metal lath and plaster, and this would be desirable in any case for insulation purposes, making the house warmer in winter and cooler in summer. With these precautions the roof framed in wood or metal lumber should be entirely acceptable, and for a number of reasons should be preferred to a concrete roof.

If the occupied rooms are partially enclosed within the roof space and are not entirely separated by fire-resistive construction from the spaces enclosed by the roof, all the precautions mentioned in the preceding paragraph are desirable and necessary, if the dwelling is to be consistently fire-resistive throughout.

In porch construction concrete is to be preferred for the floor, but personal taste and architectural preferences may dictate the use of other materials, especially for the super-structure.

Interior Finish

The time is coming when we shall see radical changes made in the methods of finishing the interior walls and partitions of dwelling houses. Many hold the opinion that the practice of applying wall plaster by hand is gradually to be superceded by better and more satisfactory methods. We are led to believe that plain white walls and ceilings will give way to fabricated coverings of various sorts which can be arranged in attractive panel effects avoiding the mess which the plasterer leaves behind him and the delay occasioned by waiting for the interior to dry out properly before applying the trim and decorative treatment. The concrete house may help to solve some of these difficulties in the opportunity it offers for skillful manipulation of the concrete itself, but in any event it is well adapted to receive any sort of interior finish, and to preserve that finish from deterioration through the stability of its structure.

Exterior Finish

The exterior treatment of the concrete house offers many possibilities, depending upon the "system" or type of wall construction. One's first thought is naturally of stucco, and this treatment will undoubtedly be prescribed for the very great majority of monolithic and block houses. Fortunately concrete is, so far as we know, the most suitable base on which to apply portland cement stucco, and the most satisfactory results are to be expected thereon, whether the stucco be of the spatter dash variety applied with a paddle, or whether it be of the exposed aggregate type requiring the greatest skill in application. I might say a great deal on this subject, but I should like to call attention to the fact that certain systems of wall construction which give a flat uniform exterior surface can be very economically and very attractively finished by a single wet dash without the use of the trowel. The cost of such a finish is only a fraction of that of the usual two coat or three coat work, and this fact ought to be some inducement toward producing more accurate surfaces in the structural wall. If the wall to which such a dash is applied is not too dense and the proper condition of suction is assured by an intelligent workman, this finish is likely to be as free from imperfection and as permanent as the most expensive stucco finish.

I am not at all sure that such a finish could not be successfully applied to a block or tile wall that was laid in a mortar of about the same degree of absorption as the unit. I believe this would be well worth trying on a small scale, and I hope that some of the block and tile manufacturers will be sufficiently interested to carry out some experiments along these lines.

It has been well established by numerous examples of group housing that houses of similar plans and similar structural design can be finished in such way as to give the appearance of being quite different houses. This is accomplished by the use of different types of roofs and porches, and by variations in the architectural and decorative treatment, for example in orientation, in finishes of brick veneer and different colored stuccos, in details of entrances, etc. This flexibility is of considerable importance in its bearing upon the individual house problem, permitting the desirable individuality of appearance in many houses from a limited number of good standardized designs.

Hydro Electric Developments

An article printed in the last issue of the Contract Record gives interesting information covering the extent of hydro-electric developments in Canada, during 1922. This amounted to 24,000 h.p. not including 190,000 h.p. installed in 1921 but brought into operation last year. The total installed water-power capacity in Canada is now practically 3,000,000 h.p. out of a total of 18,500,000—almost one sixth. The figures given in that article under the heading, "under construction or actively projected" at the present time is almost 1,000,000 h.p. The largest amount of power available belongs to Quebec with her 7,000,000 h.p. minimum flow capacity and nearly twelve millions "dependable for six months." Ontario's capacity, minimum flow, is 5,000,000 h.p. which can be increased to 7,000,000 for six months of the year. Quebec has rather less power actually under control than Ontario, the relative figures being 1,073,833 and 1,299,230 h.p. Manitoba is a good third with 3,270,000 h.p. minimum and 5,769,000 h.p. for six months, but the amount developed is small—134,025 h.p. In this respect she is quite outstripped by British Columbia where 329,000 h.p. is developed out of a possible of less than 2,000,000 h.p. The activities of the next couple of years will probably change these proportions very materially.

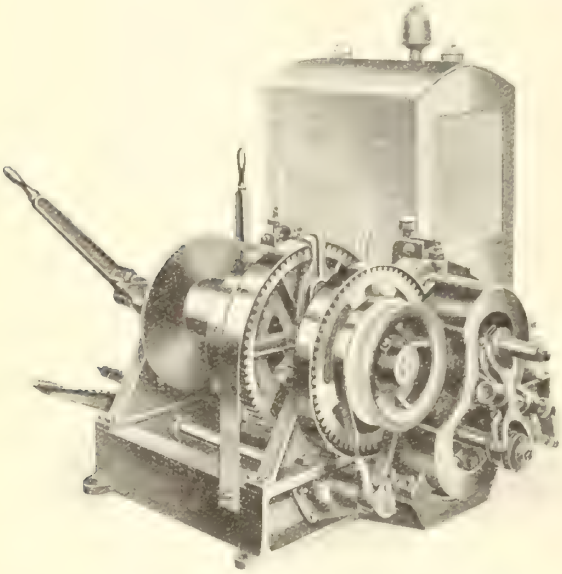
Boilers for Toronto Car Repair Shops

A contract for four 72 in. by 20 ft. horizontal return tubular boilers, of 125 lb. working pressure, built to Ontario codes, has been awarded by the Toronto Transportation Commission, to the Engineering & Machine Works of Canada, Limited, of St. Catharines, Ont. A large breeching construction, 7 ft. by 5 ft. and 60 ft. long, connects the boilers to the stack. These boilers will be installed in the new $1,000,000 repair shops being erected on Bathurst St., Toronto by the Commission.

Machinery & Equipment

Hoist with Reversing Elevator Sheave

Bulletin X, the new publication of Clyde Iron Works Sales Co., of Duluth, Minn., lists and describes an attractive line of gasoline-operated builders' hoists with reversing elevator sheave. This type of hoist has come into much favor during the past year on account of its portability, independence from outside source of power, economy and reliable service.



New Clyde builders' hoist

The hoist is built with either one or two drums and an independent clutch elevator sheave which permits double cage operation, and in addition, leaves the friction drum free for hoisting forms, reinforcing, etc. One exclusive advantage of this hoist is that while the driving gear of the friction drum is non-reversible, the elevator sheave, by means of two separate clutches, is able to reverse at will, absolutely independently. Patents covering this feature have been applied for. Motive power is supplied by a four cylinder gasoline engine and transmitted to the drum through a silent belt chain drive.

Copies of Bulletin X may be secured from the company on request.

Frame of Compressor Acts as Air Receiver

In a new Traylor portable gasoline driven compressor which the Cement Gun Co., Inc., Allentown, Pa., has recently put on the market, the frame is of extremely ingenious design, consisting of an 8 inch pipe connected with a cast steel head, which pipe acts both as receiver and as the bearing frame. The air is inletted at one end of the pipe and outletted at the other, thereby insuring extra large receiver capacity besides extraordinary cooling area.

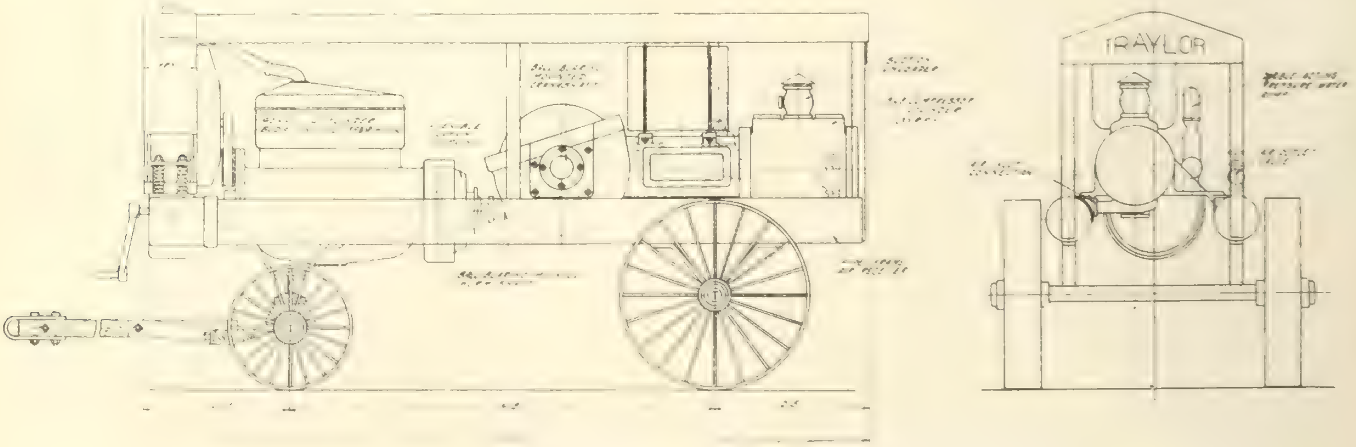
The delivery of the machine which has a 9 inch cylinder and 8 inch stroke is 100 cu. ft. of free air per minute at 100 pounds pressure. It is of the horizontal type, slow speed, driven by a 4½ in. by 6 in. four cylinder, heavy duty Buda engine.

In addition to an extra large radiator for cooling the engine this outfit is also equipped with small pressure pump bolted to the side of the frame, for supplying water under pressure to the jackets of the compressor, as well as for use in connection with the "Cement-Gun", or any other work where water under pressure is required.

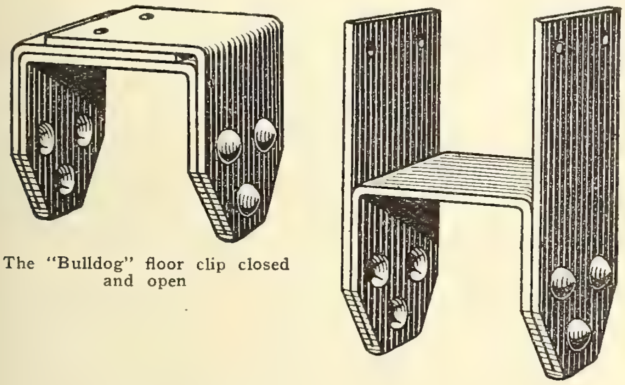
This entire equipment is mounted on trucks as shown in the accompanying line cut, and its total weight is approximately 6,500 pounds. It can also be furnished for electric drive, and can be mounted on either iron wheels, or on automobile wheels, rubber tires, axles and springs.

Clips Aid Laying of Wood Floor on Concrete

The laying of wooden floors over concrete is greatly facilitated by the use of "Bulldog" floor clips, which are claimed to make it possible to secure the many important advantages of wood floors in reinforced concrete buildings at an economical cost, at a saving in time and with a reduction of the considerable dead load due, in ordinary construction, to concrete fill. When "Bulldog" clips are used, concrete floor slabs are poured, as in all concrete work, with screens placed every 8 or 10 ft., so that as the concrete is poured it can be levelled off with a straight edge. The clips, which are then inserted in



New Traylor portable gasoline driven air compressor the green concrete at 16 in. centres both ways, are "U" shaped with tabs which are afterwards raised to receive nailing strips. A guide consisting of two planks spaced at 16 in. centres and marked along their length every 16 in. facilitates the aligning and spacing of the clips. After the slab has hardened the tabs of the clips are raised to a vertical position by means of a chisel or claw hammer. Nailing strips dressed from 2 x 2 in. stock, are then placed along the rows of clips, levelled up and slushed in with thin concrete mortar and fastened in place with a nail driven through a hole in the side of the clip. After the sleepers have been securely fastened, the floor is then laid, no fill being required to hold the strips. The dead air space is claimed to assist in sound deadening and to prevent deterioration of the sleepers and floor by dry rot. The clips are marketed by Western Steel Products, Limited, Winnipeg, Man.


The "Bulldog" floor clip closed and open

Mr. Grant Jack has been appointed assistant engineeer of York Township, Ont.

Rail-Carbon Steel Reinforcement Stands Tremendous Strain

A remarkable example of the tenacious properties of high-carbon steel reinforcement is given in an interesting bulletin issued by the Burlington Steel Company, Hamilton, Ont. The Utah Cooper Company, Salt Lake City, have a plant containing over 600 separating machines which vibrate so intensely that an ordinary individual cannot stay in the building. According to their engineer, these vibrations occur at the rate of a million times a day—for the past fifteen years. The building is reinforced with 1,500 tons of rail-carbon bars.

Steel Prices are Advancing

Building steel is the only line of building material showing any decided tendency to increased costs in the Toronto district at present. This advance has been general, however, covering every item of this line, the increase ranging from 25 cents to 75 cents per 100 lbs. Montreal also reports an advance in the price of builder's steel during the past week, this increase being as high as 50 cents per 100 lbs. on some items. Lumber is the only other line that has shown any movement whatever. Fir timbers, 10 x 10 in. and up, advanced $2.00 per M in Toronto recently, while XX B. C. cedar shingles dropped 50 cents per M.

The Ballantyne Pier, Vancouver, B. C.

A recent photograph of a project that involves six or seven million dollars

The Contract Record's

Weekly House Suggestion

No. 61

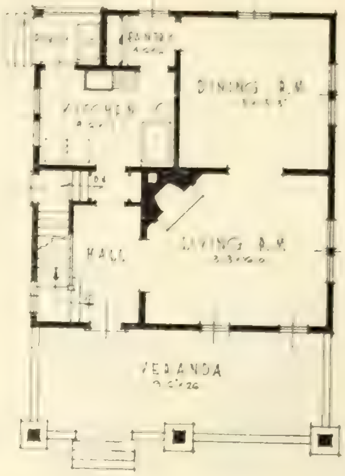
Our subject this week is an attractive, six-room, Dutch Colonial type residence, which may be erected, it is estimated, for between $6,500 and $7,500. As designed, it has an exterior finish of siding, which continues around the porch except under the columns supported by field masonry piers, but this exterior finish could be easily varied if desirable, using brick or stucco for the lower storey and wood siding or shingles above.

This house has an exceptionally fine front verandah, running the full width of the house and opening on a roomy hallway with direct access to the kitchen. Popular open fireplace is located at an angle in the living room and there are wide-cased openings from both hall and dining room. French doors could be used in either or both if desired. The dining room and kitchen are both good-sized rooms and are conveniently laid out. The entire layout, in fact, has been well planned and suggests economy and convenience in arrangement.

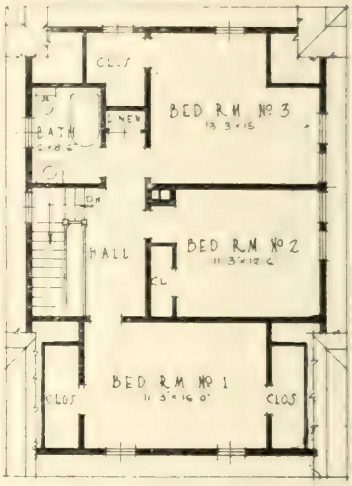
On the second floor there are three large, well-lighted and well-ventilated bedrooms, each with ample closet space. The bathroom contains a built-in medicine closet in addition to the usual fixtures. There is a linen closet in the hall.

The basement is full size and is divided off into laundry and drying room, boiler room and usual coal and fruit storage space.

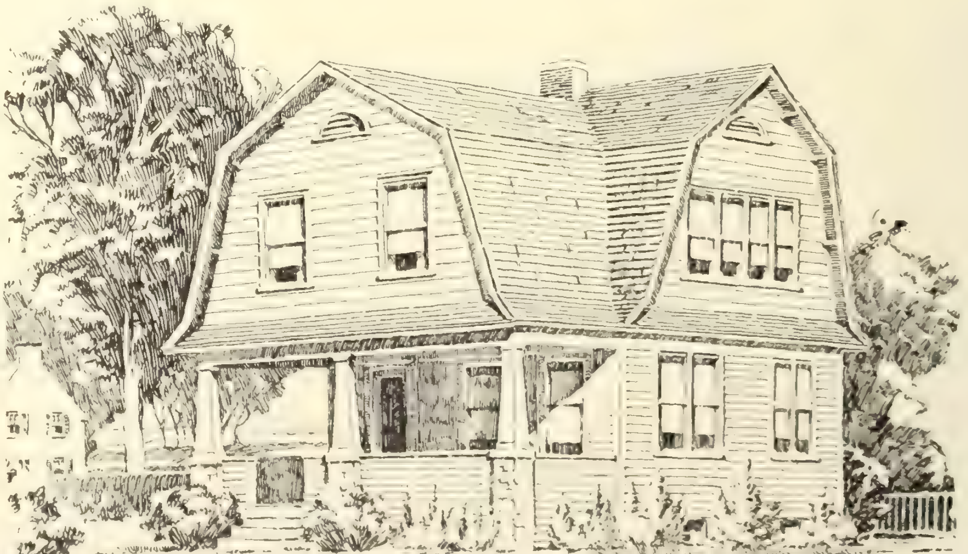
This residence was designed by Mr. Whitman S. Wick, of Middleton, N. Y. and has many excellent features that commend it to the home builder of moderate means.



FIRST FLOOR PLAN



SECOND FLOOR PLAN



Mainly Constructional

East and West—From Coast to Coast

The sum of $600,000 has been spent by the Relief Committee up to the present time, in Northern Ontario, on re-establishment work, and the committee estimates they will require another $400,000 to complete their work this year.

According to statistics issued at Ottawa recently, while the number of strikes and lockouts in Canada during the year 1922 was only 85 as compared with 145 during 1921, the number of workers involved in 1922 was 41,050 as compared with 22,932, and the number of working days lost amounted to 1,975,276 as compared with 956,461 during the previous year. Approximately 50 per cent. of the time lost on this account last year was in connection with strikes of coal miners in Alberta and British Columbia lasting from April till the end of August. In addition to the western coal strikes, a strike in Nova Scotia coal mines last August affected 15,000 workers and involved a loss of some 200,000 working days.

Bowles Restaurants, Limited, contemplate the erection of a ten-storey restaurant, store and office building on the north-east corner of Front and Bay streets, Toronto. The cost will be $700,000.

The city of Port Arthur, Ont., has received an offer from a private individual in New York, to build 1,000 homes in Port Arthur, providing conditions warrant it. This offer was contained in a letter to the Chamber of Commerce and Duncan Roberts, secretary, is preparing statistics to forward to this party.

The St. Maurice Power Company, Limited, has given notice that it will apply for authorization to construct a dam, power house and other works incidental thereto on the water course in the Parish of Saint Etienne Des Gres., St. Maurice county and Notre Dame Du Mont Carmel, Champlain county.

Fire done damage amounting to $20,000 to the plant of the Sarnia Cement Products Co., Sarnia, Ont., recently. The company has indicated their intention to rebuild.

The Minister of the Interior has set the date for the opening of the Banff-Windermere motor highway through the Canadian Rockies for Saturday, June 30. The official ceremony will take place about noon at Vermilion Crossing, a point midway between Banff, Alberta, and Windermere, British Columbia. The new highway, which forms the connecting link in the 6,000 mile "Grand Circle Tour," through Western Canada and the United States, was completed last fall and the engineers expect that by the end of June everything will be in readiness for the opening and the summer traffic.

A recent announcement states that work will be commenced this spring on the construction of a new cantilever bridge across the Niagara River, alongside the present structure, at Niagara Falls, Ont. The American Bridge Company has been awarded the contract for the steel work.

At the recent annual meeting of the Saskatchewan Branch of the Engineering Institute of Canada, the following new officers were elected: Chairman, Lieut.-Col. A. C. Garner, Regina; vice-chairman, Prof. C. J. MacKenzie, Saskatoon; secretary-treasurer, D. A. R. McCannel, Regina; executive committee, H. N. MacPherson, Regina; J. D. Peters, Moose Jaw; Prof. Williams, Saskatoon; R. Loucks, Regina; nominating committee, M. B. Weeks, Regina; J. McD. Patton, Regina; H. L. Phillips, Regina; E. H. Phillips, Saskatoon; S. Young, North Battleford.

Bricklayers and masons at Quebec, P.Q., are demanding increases in wages, a recent report from that city states, a notice in a recent issue of the "Chronicle" announcing that after May 1 this year, the rate for bricklayers will be 90c an hour instead of 75c and for masons 80c an hour instead of 65c.

Personal

Mr. R. O. Wynne-Roberts has retired from the engineering firm of Frank Barber & Associates, of Toronto, and has formed a new partnership with his son, Capt. L. W. Wynne-Roberts, to carry on a consulting engineering business in Tornoto, under the firm name of Wynne-Roberts & Son.

The Township Council at Niagara Falls, Ont., recently reappointed Merle F. Kerr engineer and road superintendent for another year.

It has been reported that M. Roisin, one of France's greatest architects, who is coming here in a few months to complete the plans for Cardinal Taschereau's monument, has accepted to be a member of a commission of three architects, which already includes Col. Audette, of Quebec, and Mr. Daoust, of Montreal, to revise the plans of the new St. Anne de Beaupre church.

Mr. W. P. Near, former city engineer of St. Catharines, Ont., has been appointed city engineer of London, Ont., succeeding Mr. H. A. Brazier who resigned recently. Mr. Near was connected with the city of St. Catharines, as city engineer, since 1913, previous to which he was employed by the city of Toronto, being in charge of the construction of that city's large trunk sewer system in 1911. Mr. Near is a native of St. Mary's, Ont., and received his education at St. Mary's Collegiate Institute and at the University of Toronto, graduating from the latter with the degree of B. A. Sc., with honors, in 1907. While he was connected with the city of St. Catharines, he supervised several large engineering undertakings, including the construction of a 1240 ft. steel high level bridge, a 13-arch concrete bridge, the laying of a trunk sewer system and extensive street paving.

Mr. A. R. Goldie, of the Goldie & McCulloch Company, of Galt, Ont., was recently elected chairman of the Industrial Accident Prevention Association.

Mr. A. L. Farquharson, of Toronto, late manager of the Public Utilities of Fort William, Ontario, was recently appointed manager of the Public Utilities Commission of Brantford, Ont., in succession to Mr. J. Amos Johnston, who has resigned. He will assume his new duties on April 1.

Obituary

Sir William Scott, general manager of the Anglo-Newfoundland Development Company, a former member of the engineering staff in the construction department of the Canadian Pacific Railway, died on March 5 in England.

Mr. Alexander C. Bryson, prominent Winnipeg contractor, died in that city recently, aged 77.

Trade Incorporations

National Cement Company, with head office at Montreal, capital $4,000,000, to manufacture and deal in cement and the by-products thereof.

Messrs. St. George & Gauvreau, 127 Stanley St., Montreal, highway engineers and general contractors, have incorporated with a capital of $149,000.

CONSTRUCTIONAL ACTIVITY

Period of March 14 to March 20, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Bourget, Ont.
Clarence Township Council wants tenders on a drain running from concession 3 to 4. J. A. Menard will receive tenders until Apr. 2.

Buckingham, Que.
Council contemplates cement sidewalks costing $1,000. D. Lahaie, mayor.

Fergus, Ont.
Paving of St. Andrew St. will shortly be considered by the Town Council. John Gregson, reeve.

Fonthill, Ont.
Town Council contemplates the installation of a waterworks system and James, Proctor & Redfern Ltd., engineers, Toronto, are preparing plans.

Guelph, Ont.
Tenders being received until Mar. 29 by the Chairman of Board of Works, Ald. A. Jaffrey, for resurfacing asphalt.

Hamilton, Ont.
Laying 100 feet of 36 inch steel intake pipe is contemplated by the City. Cost will be about $2,750. S. H. Kent, clerk.

City contemplates deepening a drain on the Mountain. Mayor Jutten & Controller Tope, interested.

Suburban Area Commission, County Court House, plan the concreting of a road and bridge. Mr. Vance, secretary.

City Council proposes to widen Main St. to 84 feet. S. H. Kent, clerk.

City Council contemplates the widening of the Valley Inn Road. S. H. Kent, clerk.

Kingsville, Ont.
Concrete pavement contemplated by the Town Conucil. Chairman of Committee, Ald. Webb.

Kitchener, Ont.
Tenders for 2,000 sq. yds. of concrete pavement and 10,000 sq. yds. of asphalt pavement will be received until Mar. 26. S. Shupe, engineer.

Logan Twp., Ont.
Township Council contemplates a drainage system. L. G. Rock, Broadgahen, Ont., clerk.

London, Ont.
London Street Railway Co. may pave the right of way on three streets. C. B. King, manager.

Mascouche, Que.
Macadam road contemplated by the Provincial Government. J. W. Beaudoin, Mascouche, secretary.

McGillivray Twp., Ont.
Councils of McGillvray and Stephen Townships contemplate a drainage system costing $100,000. J. D. Drummond, clerk of McGillvray Township.

Moncton, N. B.
Concrete sidewalks contemplated by the city. Road gravel, concrete gravel, sand and cement required. J. Edgington, engineer.

Mount Forest, Ont.
Town Council contemplates paving the main street. Mr. Allen, mayor.

Norfolk County, Ont.
Road improvements costing $78,000 including the erection of a bridge will shortly be considered by the Council. G. R. Marston, Simcoe, Ont., engineer.

Port Colborne, Ont.
Roadwork is contemplated this spring by Town Council. J. H. White, clerk.

Port Dalhousie, Ont.
Lincoln County Council, St. Catharines, contemplates pavement. C. Wismer, St. Catharines, clerk.

Sewers are contemplated by the Council. Mr. Lanson, St. Catharines, engineer; A. Wallace, Port Dalhousie, clerk.

Sabrevois, Que.
Two miles of macadam road will be laid for the Town Council at a cost of $15,000.

St. Norbert, Que.
Gravelling a road at a cost of $10,000 planned by the Town Council. J. O. Laporte, secretary.

Stoke Twp., Que.
Earth road costing $4,000 planned by the Town Council. E. Marquis, Stoke Centre, secretary.

Toronto, Ont.
City will receive tenders on sewers until Mar. 27. Specifications at Room 6, City Hall.

Waterford, N. S.
Provincial Government contemplates a highway from Waterford to Sydney at a cost of $35,400. This will include a bridge across Lingan Bay. Local engineer, R. L. Waycott, Sydney.

Windsor, Ont.
Filtration plant proposed by the Essex Border Utilities Commission, 300 Oulette Ave., Windsor. J. Clark Keith, Windsor, and Gore, Nasmith & Storrie, Confederation Life Bldg., Toronto, engineers.

CONTRACTS AWARDED

Bosanquet Twp., Ont.
Broderick Bros., c/o G. A. McCubbin, 136 King St., Chatham, have the general contract for a drainage system for the townships of Stephen, Bosanquet, West Williams and McGillivray at a cost of $60,000.

Brantford, Ont.
Contracts for the year's supply of cement awarded by the city to Canada Cement Co., Toronto; cement for Lorne Bridge, Alf. Rogers Ltd., Toronto; castings, Hartley Foundry Co., Brantford.

Ottawa, Ont.
T. McAvity & Sons Ltd., 320 St. James St., Montreal, has the contract for pipe for 6 inch watermains being laid by the city.

Port Credit, Ont.
The general contract for a new waterworks system for the Mississauga Golf Club has been awarded to the National Equipment Co. Ltd., 1 Wabash Ave., Toronto. The approximate cost will be about $10,000.

Province of Ontario
Additional contracts for 1923 roadwork awarded as follows: No. 794, Concrete pavement, Brantford to Paris, 5.6 miles. Macnamara Bros. & Thornton, 23 Scott St., Toronto; 827, Concrete pavement, westerly from pavement west of Chatham, 3.7 miles, Macnamara Bros. & Thornton, 23 Scott St., Toronto; 830, Asphaltic concrete pavement, Stratford easterly, 3.6 miles, Brennan Contracting Co., Melrose Ave., Hamilton; 831, Asphaltic concrete pavement, Port Credit to Cooksville, 2.43 miles, Brennan Contracting Co., Melrose Ave., Hamilton; 919, Asphaltic concrete pavement, Yonge St. from Thornhill to northerly limits of Vaughan Twp., 6.9 miles, Warren Bituminous Paving Co. of Canada, University Ave., Toronto; 828, Concrete pavement, Clappison's Corners to Bridge No. 3, 2.0 miles, Bate, McMahon & Co., Central Chambers, Ottawa.

Toronto, Ont.
J. L. Jerou, 90 Curzon St., has been awarded the contract for relief sewers No. 1 and No. 2 at $130,807.

Railroads, Bridges and Wharves

Arthur, Ont.
Provincial Government plans to build a cement arch bridge. W. A. McLean, Parliament Buildings, Toronto, Deputy-Minister.

Beaver River, N. S.
Rebuilding warping piers at a cost of $13,350 contemplated by the Dominion Government. This item has been included in this year's estimates. R. C. Desrochers, Ottawa, secretary.

Bromptonville, Que.
Concrete bridge planned by the Town Council. Tenders will be called in May. J. A. Ouellet, secretary.

Canso, N. S.
Wharf contemplated by the Dominion Government at a cost of $7,700 included in estimates for 1923.

Chimney Corners, N. S.
$13,400 included in the estimates for 1923 for the completion of the wharf R. C. Desrochers, Ottawa, secretary.

Fergus, Ont.
Town Council will shortly consider

the construction of a steel or concrete bridge. John Gregson, reeve. A. W. Connor, 34 Victoria St., Toronto, engineer.

Montreal, Que.
Reconstruction of several subways is contemplated by the City Council. S. Fortin, engineer; R. Bauset, clerk.

Mount Forest, Ont.
Wellington County is having plans prepared for a bridge costing about $30,000. A. W. Connor, 34 Victoria St., Toronto, engineer.

St. Dennis Sur Richelieu, Que.
Bridge of reinforced concrete construction costing $3,000 contemplated by the Town Council. E. Chaput, secretary.

St. Norbert, Que.
Concrete bridge planned by the Town Council. J. O. Laporte, secretary.

St. Thomas de Jolliette, Que.
Plans are being prepared for the rebuilding of a bridge. Work will proceed in May. H. Lasalle, mayor.

Sydney Mines, N. S.
$5,000 allowed in the 1923 estimates for the proposed repairs to the wharf owned by the Dominion Government. R. C. Desrochers, Parliament Buildings, Ottawa, secretary.

West L'Ardoise, N. S.
Dominion Government contemplates an extension to the breakwater and $7,500 allowed in 1923 estimates for this work. R. C. Desrochers, Ottawa secretary.

Windsor, Ont.
Detroit & Windsor Ferry Co. Detroit, contemplates docks costing $400,000. Walter Campbell, president.

CONTRACTS AWARDED

Shawbridge Parish, Que.
Phoenix Bridge & Iron Works Ltd., 83 Colborne St., Montreal, has the contract for steel in the $22,000 steel and concrete bridge being erected for the Provincial Government by Armand Sicotte & Cie, 745 Davaar Ave., Outremont.

Public Buildings, Churches and Schools

Alliston, Ont.
Tenders will be called shortly for excavating and cement for a Memorial Hall. J. A. Hutchinson, a member of the Citizen's Committee, interested.

Brampton, Ont.
Tenders for a hall for Peel County Agricultural Society will be received until Mar. 27. Smith & Wright, 2945 Dundas St., Toronto, architects.

Brantford, Ont.
Tenders have been called closing on Mar. 29 for the $45,000 building for the Board of Education. F. C. Bodley, Temple Bldg., architects.

Bronte, Ont.
Tenders will be called shortly for $40,000 school. Smith & Wright, Dundas St. W., Toronto, architects.

Cayuga, Ont.
Tenders are being received for all trades, except plumbing and heating, for Cayuga Court House and Jail by R. S. Colter c/o Frank Barber & Associates, 40 Jarvis St., Toronto.

Dundas, Ont.
Plans are drawn for St. James' Church costing $50,000. McPhie & Kelly, Bank of Hamilton Bldg., Hamilton, architects.

Fredericton, N. B.
Plans are drawn for an Agricultural School estimated to cost about $100,000. Provincial Government will call for tenders shortly.

Kingston, Ont.
Tenders will be received until Mar. 29 for roofing, sheet metal, plumbing, heating, ventilating, electric wiring, lathing and plastering for the library for Queen's University.

Kitchener, Ont.
Sisters of St. Joseph, Hamilton, are raising funds for a $300,000 hospital. Rev. A. L. Zinger, 57 Duke St., Kitchener, chairman of the building committee. Architect not yet appointed.

Lorne Park, Ont.
Tenders for a school costing $40,000 will be received by R. B. Colloton, secretary, Lorne Park Rd., until Mar. 31.

Montreal, Que.
City will repair police and fire stations during the coming summer. S. Fortin, clerk.

Trinity Memorial Church is having plans prepared for a $200,000 edifice. Ross & MacDonald, 1 Belmont St., are the architects. Work is expected to proceed this spring.

Plans for an addition to a college are being prepared by J. A. Benoit, 1200 Wellington St. Tenders will be called this summer.

North Easthope Twp., Ont.
Trustees of S.S. No. 7 plan a school costing $9,000. J. D. Fisher, Stratford, Ont., Township Clerk.

Ottawa, Ont.
Fourth Ave. Baptist Church contemplates a new building. Pastor, Chas. Duncan, 21 Wilton Cres.

City has selected a site for a Fire Station and will build this summer. Alterations to garage at Queen and Duke Sts., for a Fire Hall also contemplated. Mr. Burnett, Fire Chief.

Pembroke, Ont.
Bulk tenders only are being received by W. C. Keighley, 56 Pembroke St. E., for a public school costing $100,000.

Perth, Ont.
The congregation of St. Andrew's church will rebuild the building recently destroyed by fire at loss of $50,000. Rev. A. H. Scott, minister.

Peterboro, Ont.
Salvation Army will build a temple costing $28,000. W. J. Braund, 493 Albert St., builder.

Province of Quebec.
J. E. A. Benoit, 1200 Wellington St., Montreal, is preparing plans for alterations to a church to cost $150,000 and expects to call tenders in June.

Ste. Anne De Beaupre, Que.
Plans are being prepared and tenders will be called soon for the rebuilding of the Basilica at a cost of about $1,000,000. L. N. Audet, 70 King St. W., Sherbrooke, architect.

St. Lambert, Que.
The Protestant School Board is having C. R. Tetley prepare plans for a $40,000 school. Address, 314 Beaver Hall Hill, Montreal.

St. Thomas, Ont.
City Council and the Hospital Board will call for tenders shortly for the $140,000 addition to the hospital. Darrach & Findlay, 430 Talbot St., architects.

Southwold Twp., Ont.
School costing $13,000 planned for Yarmouth and Southwold Twps. Fred Hill, R.R. 6, St. Thomas, secretary.

Strathroy, Ont.
Messrs. J. W. Cameron & A. W. Bixel propose to build a nurses' home costing $10,000.

Sydney, N. S.
Tenders for a community hall will be received by Rev. J. H. Hamilton, 59 Milton St., until Mar. 27.

Congregation of the African Episcopal Church contemplates a $10,000 building. M. R. Chappell, architect.

Toronto, Ont.
St. Clair Avenue Methodist Church will call for tenders for its $100,000 edifice next month. Chas. Summerfield, 47 Humewood Ave., Chairman of the Building Committee.

St. Monica's Church, Ashdale & Gerrard, contemplate a new edifice costing $40,000. Rev. G. M. Barrow, 102 Eighth Ave., minister.

Turnbull Elevator Co. Ltd., John St., are installing the ash hoist in Kitchener School. R. C. Dancy, 57 Kendall Ave., has the plastering contract at $7,200.

Verdun, Que.
Post Office contemplated by the Dominion Government. R. C. Desrochers, Ottawa, secretary.

A $50,000 addition to St. Clements Anglican Church proposed and Ross & MacDonald, Belmont St., Montreal, have prepared sketch plans. Rev. J. F. Morris, 402 Lasalle St., rector. Work may proceed this spring.

York Twp., Ont.
Bulk and separate tenders being received by D. R. Franklin, 587½ Yonge St., Toronto, for an $80,000 addition to a school.

CONTRACTS AWARDED

Assiniboia, Sask.
The general contract for the $16,000 addition to the Public School awarded to W. J. Jones, 1140 Main St., Moose Jaw, Sask.

Belleville, Ont.
The general contract for the extensions to Albert College awarded to Dickie Construction Co., Ryrie Bldg., Toronto.

Rawdon, Que.
S. Beaupre, who is building a $35,000 hotel, has awarded the following contracts: Roofing, Turcot Ltd., 1681 Clarke St., Montreal; electrical, E. La-

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

Tenders for Asphalt Resurfacing

Sealed tenders, marked "Tender for Asphalt Resurfacing," addressed to Alderman Alex. Jaffrey, Chairman, Board of Works, in care of City Clerk, Guelph, Ontario, will be received until 12 o'clock noon,

Thursday, March 29th, 1923,

for the resurfacing of certain streets with asphalt.

Specifications may be seen and form of tender obtained at the City Engineer's Office, Guelph, on and after March 13th, 1923.

The lowest or any tender not necessarily accepted.

H. S. NICKLIN,
City Engineer.

City Engineer's Office,
Guelph, March 8. 1923. 11-12

Highway Construction

TENDERS

Will be received until noon.

Tuesday, March 27th, 1923

by the London Suburban Roads Commission for Furnishing Material and Building Highway (including approximately 2100 cubic yards of concrete) known as the Pipe Line Road in the Township of Westminster, County of Middlesex.

Plans, specifications, form of tender, information to bidders and form of agreement may be seen at the County Engineer's Office, County Buildings, London, Ontario.

CHAS. TALBOT, Engineer,
E. S. LITTLE, Chairman,
12 Suburban Roads Commission.

Extension of Time Court House and Gaol

County of Haldimand

Bulk tenders for all trades (except Heating and Plumbing) required in the erection and additions to Court House and Gaol at Cayuga, Ontario, will be received by R. S. Colter, Cayuga, Ontario, up to 5 P.M.,

March 30th, 1923,

Bidders are also requested to submit tenders on a cost plus basis with the limit of cost.

Separate tenders will be received for Heating and Plumbing.

NOTE—Tenders for the installation of water and sewage system to be called for later.

Plans and Specifications may be seen, after March 17th, 1923, at the office of R. S. Colter, Cayuga, and at the offices of Frank Barber and Associates Limited, 45 Jarvis St., Toronto, and the Union Bank Building, Dunnville, Ont. (E. [illegible], Resident Engineer.) 11-12

RATES

20 cents per agate line (14 lines to the inch) Positions Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

TENDERS

Sealed bulk and separate tenders addressed to Jas. Knox, Secretary, 189 Rosethorn Avenue, Toronto, endorsed with the word "Tender," will be received until

April 3rd, 1923

for all trades in the erection of an addition to the Silverthorn Public School, S.S. 35.

Tenders must be in the hands of the Secretary not later than four o'clock p.m. on the day named, after which no tender will be received.

The lowest or any tender will not necessarily be accepted.

Plans and specifications may be seen and all information obtained at the office of the Architect, D. R. Franklin, 587½ Yonge Street, Toronto.

ERNEST WESTBURY,
12 Chairman.

TENDERS

Tenders for all trades (except Mechanical Trades) will be received by the undersigned until 12 o'clock noon on **Tuesday the 3rd, proximo,** for the erection and completion of

St. Ann's Church, Barton St. and Sherman Ave., Hamilton.

Tenders for the Masonry, Reinforced Concrete, Carpentry and Painting will be required in bulk.

Plans and specifications may be seen at the office of the Architect, and also at St. Ann's Rectory, Hamilton.

The lowest or any tender not necessarily accepted.

ARTHUR W. HOLMES, Architect,
12 79 St. Joseph Street, Toronto.

Notice to Electrical Contractors

Sealed tenders addressed to the Queen Victoria Niagara Falls Park Commission at Niagara Falls, Ontario, will be received by the undersigned until 12.00 o'clock noon, **March 24th, 1923,** for the installation of a

Park Lighting System

Specifications may be seen and form of tender obtained at the Administration Building, Niagara Falls, Ontario. Each tender must be accompanied by a marked cheque for $1,000.00, payable to the Park Commissioners.

The lowest or any tender not necessarily accepted.

JOHN H. JACKSON,
11-12 Superintendent

Township of Vaughan

Tenders for Bridge

Sealed tenders, plainly marked as to contents will be received by the undersigned up to

Saturday 12 o'clock Noon, March 31, 1923

for the construction of a Reinforced Concrete Bridge on the Langstaff sideroad, about one half mile west of Yonge Street, in the Township of Vaughan.

Plans and Specifications may be seen at the office of the undersigned, 45 Jarvis Street.

The lowest or any tender not necessarily accepted.

FRANK BARBER,
Township Engineer.

FRANK BARBER AND ASSOCIATES Limited,
Consulting Engineers,
45 Jarvis Street,
Toronto.

Toronto, March 16, 1923. 12

CITY OF BRANTFORD

Tenders for Reinforced Concrete Arch Bridge

Sealed Tenders marked "Tender for Lorne Bridge" addressed to Ald. C. S. Moyer, Chairman Board of Works, in care of the City Clerk, Brantford, Ontario, will be received until 12 o'clock noon

Saturday, March 24th, 1923

for the construction of a three span reinforced concrete arch bridge, approximately five hundred feet long and sixty four feet wide, across the Grand River.

Plans and specifications may be seen and Form of Tender obtained at the City Engineer's office, Brantford on and after Monday March 5th. 1923.

The lowest or any tender not necessarily accepted.

FRANK P. ADAMS.
City Engineer.

City Engineer's Office,
Brantford, February 27th, 1923. 10-12

WANTED

DUMP WAGONS AND SPREADER WAGONS

Apply
PATTERSON CONSTRUCTION CO. Ltd.,
Belleville, Ont, 12

Tenders Wanted

Tenders will be received by the undersigned until

Monday, April 16th, 1923,

for the erection of a four roomed School Building in the Town of Milverton, Perth County.

Plans and specifications may be seen at Wm. Smith's Shop, Main Street.

W. J. SPENCER,
Sec-Treas. School Board.
12-14

TENDERS

Tenders will be received for the erection of a Manse, up till **April 2nd**, by W. J. B. Davidson, Secretary for the Presbyterian Manse Committee, Port Hope, Ontario.

Tenders to be separate or in bulk, but no tender necessarily accepted.

Plans may be seen at the office of the Secretary, or at the offices of

ELLIS, ELLIS & RICHARDSON,
Architects,
12-13 Manning Chambers, Toronto.

Tenders Wanted

BOARD OF EDUCATION

Sealed tenders, addressed to the Business Administrator and Secretary-Treasurer, Board of Education, Administration Building, 155 College St., endorsed with the word "Tender" and also with the name of the school building and trade or article to which it relates, will be received until

Tuesday, March 27th, 1923, for

1. **Electric Wiring for JARVIS NEW COLLEGIATE.**
2. **Roofing and Tinsmithing for HUMBERSIDE COLLEGIATE.**
3. **Heating, Ventilation, Plumbing, Heat Regulation for LESLIE GARDENS.**
4. **Iron Fire Escape Ladders for ADMINISTRATION BUILDING.**
5. **Electric Wiring for PYNE SCHOOL.**
6. **Lathing and Plastering for GLEDHILL SCHOOL.**

Specifications and conditions of tendering may be seen and all information obtained at the office of the Architect of the Board, 155 College St., Telephone Trinity 8200.

Tenders must be in the office of the Secretarial Department at the Administration Building, 155 College St., **not later than 4 P.M. on the day named**, after which no tender will be received.

The lowest or any tender will not necessarily be accepted.

F. E. POWELL,
Chairman Property Committee.
W. W. PEARSE,
Business Administrator and Secretary-Treasurer.
12

OPEN FOR POSITION as foreman or superintendent, 20 years experience concrete bridge and culvert, pile driving, coffer dam work. References if necessary. Will go anywhere. Box 495, Burlington, Ont. 10-12

CONSTRUCTION SUPERINTENDENT, graduate and trained civil engineer, open for position in three weeks' time, with contracting or construction company. Bridges, buildings, railroad work. Experienced office or field. Just successfully completing concrete contract large railroad bridges in North. Box 181 Contract Record, Toronto. 12-13

Tenders for Bridge

Sealed tenders, plainly marked as to contents and addressed to the undersigned, will be received up to one o'clock noon,

Friday, April 6th,

for construction of a 112 ft. steel bridge opposite Lot 44, Con. "A", Greenock Township. Separate tenders for steel and concrete work.

Plans and specifications may be seen at the office of the undersigned.

The lowest or any tender not necessarily accepted.

GEORGE E. STEPHENSON,
County Engineer,
12 Walkerton, Ont.

TENDERS

Sealed tenders, separate or bulk, plainly marked as to contents and addressed to the Secretary of the School Board will be received up to 5 o'clock, P.M.

Friday, April 6th,

for the erection of a four room School Building at Bronte, Ont.

Plans and specifications, tender forms and all information may be obtained from the Secretary of the Board or at the Office of Smith & Wright, Architects, Dominion Bank Chambers, 2945 Dundas St. W., Toronto on and after Saturday, March 24th.

A deposit of $10.00 is required to assure the return of the plans.

The lowest or any tender not necessarily accepted.

LeROY SARGANT, Secretary,
S.S. No. 13 Trafalgar,
12-13 Bronte, Ont.

TENDER FOR SCHOOL BUILDING

Sealed tenders for the erection of a new Public School in West Brantford, addressed to Rev. Charles E. Jeakins, Chairman of the Buildings and Grounds Committee of the Brantford Board of Education, c/o Arthur K. Bunnell, Secretary, City Hall, Brantford, will be received up to noon, on

Saturday, March 31st.

A marked cheque for not less than 5% of the amount of the tender must accompany same.

Copy of plans and specifications, and any further information, will be furnished on application to Frederick C. Bodley, Architect, Temple Building, Brantford.

The lowest or any tender not necessarily accepted.

ARTHUR K. BUNNELL, Secretary.
12

COUNTY OF HALDIMAND

Court House and Jail

Heating and Plumbing

Sealed tenders, plainly marked as to contents, will be received by R. S. Colter, Esq., Cayuga, up till five o'clock,

Friday, March 30th,

for Heating and Plumbing for above building.

Plans and specifications may be seen at the office of R. S. Colter, Esq., Cayuga, Ont., or at the offices of Frank Barber and Associates, Limited, 45 Jarvis Street, and Union Bank Building, Dunnville, Ont. Ernest Hinchliffe, Resident Engineer.

12

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In a good, live Western town, a Builders' Supply business, including an up-to-date plant for manufacturing cement block, field tile, sewer crock, fence posts, ornamental vases, etc.

A first class business in a first class locality, satisfactory reasons for selling. Apply Box 182, Contract Record, Toronto. 12

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It may be occupying valuable space in your yard or shop, collecting dust, rust and hard knocks.

Sell it before "Depreciation" scraps it.

Use the Tender & For Sale Department. It helps others, let it help you.

FOR SALE

Keystone Excavating Machine, complete with two sticks, skimmer scoop, and three ditching scoops; this machine has been used only one season and is guaranteed to be in first class condition. Price $4,500 f.o.b. St. John, N. B.

Austin Backfiller with caterpillar traction, 4-cylinder Buffalo engine, in equally good condition. Price $2,500 f.o.b. St. John, N. B. Canada Lock Joint Pipe Limited, 65 Pleasant Boulevard, Toronto, Ont.; or St. John, N. B. 6-T.f.

FOR SALE

All Steel Derrick Car

This is a Standard, Steel Centre, Girder Construction Flat Car
36 feet long—100,000 lbs. Capacity,

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Separate Friction, Swinging Gear Direct Connected to Engine;
Vertical Steel Boiler—Wooden Cab

All Steel Counterweight Derrick with 32 foot Steel Boom; Lifting Capacity about 5 Tons at 20 ft. Radius.

Car is Self-Propelled by Chain Drive arranged for on Both Trucks.

Complete with Cable and Blocks—
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CONSTRUCTION SUPERINTENDENT with 15 years experience handling all classes of building and water work, wants position. A1 testimonial and guarantee results. Will go anywhere. Box 147, Contract Record, Toronto. 12-14

GENERAL CONSTRUCTION SUPERINTENDENT with 25 years experience handling all classes of Buildings. Practical also Registered Professional Civil Engineer, wants position. A1 references. Will go anywhere. Box 175, Contract Record, Toronto. 11-14 [illegible] St. Jacques, Que., plumbing and heating, J. Landreville, Joliette, Que. Prices are [illegible] on 35,000 [illegible] and [illegible] brick.

Stanhope, Que.
Chas. Desautels, Sherbrooke, has been awarded the general contract for the convent for the Sisters de la Presentation.

Tetreaultville, Que.
[illegible], 331 De Laroche St., Montreal, has the contract for stone and brickwork for the presbytery and chapel for the Catholic Church. F. Lapalme, 601 Lacordaire St., Montreal, is doing the concrete work.

Toronto, Ont.
Peerless Artificial Stone Co., Toronto, have the contract for art stone for Eglinton Methodist Church. Hepburne & Disher, Van Horne St., have the contract for steel.

Contracts for plumbing, heating and ventilating for Jarvis Collegiate awarded by the Board of Education to W. J. McGuire Ltd., 91 Jarvis St.

Business Buildings and Industrial Plants

Buckingham, Que.
Jas. McLaren Co. will make a $7,000 addition to offices. J. P. McLaren, 104 Sparks St., Ottawa, architect.

Delaware, Ont.
Stanley Merrill is receiving tenders for a bank and Masonic hall costing about $15,000.

Ford, Ont.
Windsor Construction Co. is excavating for a refrigerator and storage plant for the Windsor Ice & Coal Co., Walkerville. Cost will be about $20,000.

Halifax, N. S.
Canadian Bank of Commerce, Toronto, contemplates an addition to their building. S. P. Dumaresq, Halifax, associate architect.

John W. Regan, Scott Bldg., Halfax, contemplates an hotel costing $400,000. S. P. Dumaresq, Royal Bank Bldg., architect.

Hamilton, Ont.
Store and apartment costing $25,000 planned by J. A. Zvokn, 721 Barton St. E.

Hamilton, Ont.
Tenders for excavating, concrete, brick and structural steel for the coke and gas oven plant are being received by R. J. Foley, Landed Bank & Loan Bldg., engineer. Work will start about Apr. 1.

Hyde Park, Ont.
Garage and service station costing $15,000 contemplated by R. E. Morris.

Jarvis, Ont.
Caledonia Dairy Ltd., Caledonia, preparing plans for a dairy and ice cream plant costing $10,000.

Landrienne, Que.
Lascierie Landrienne Ltd., J. H. Lemay, manager, contemplates a store costing $15,000.

Lindsay, Ont.
Plans are being prepared for a factory for Jas. Horn Knitting Co. T. Pringle & Sons, 84 King St. E., architects.

London, Ont.
London Iceless Refrigerator Co. contemplates a factory. Mechanical Superintendent, W. T. Clarke, c/o Clark Machinery Co., 564 Bathurst St., London.

G. A. Brickenden, London Loan Building, wants tenders on stores and apartments costing $40,000. W. G. Murray, Dominion Savings Building, architect.

Moncton, N. B.
Canadian Oil Co. Ltd., Barrack Point, St. John, has purchased the site for a $50,000 oil distributing plant and expects to proceed with the erection of the building in May.

J. D. Creaghan Co., Main St., plan an extension to their store at a cost of $20,000.

Montreal, Que.
Layton Bros., 550 St. Catherine St. W., are having plans prepared for alterations and additions to an office building. Mr. Clarke, manager.

G. E. S. Bishop, 21 Drummond St., has applied for permission to build an automobile repair shop. If granted, work will proceed at once.

Goodwins' Ltd., St. Catherine St. W., will rebuild the garage and warehouse destroyed by fire.

Steel Co. of Canada, 1272 Notre Dame St. W., plans an office building. E. E. Kirkpatrick, c/o owners, engineer.

$6,000 storage building contemplated by Colgate & Co., 74 St. Ambroise St. Tenders will be called shortly.

Oakville, Ont.
Wm. Whittaker & Sons have had plans drawn for a garage. Work will proceed shortly.

Ottawa, Ont.
Keith Vaudeville Circuit of America New York, contemplates a theatre. Managing Director, F. F. Albee.

Tenders will be called shortly for show rooms costing $18,000 for Geo. Halliday, Noffke, Morin & Sylvester, Central Chambers, architects.

A. J. Frieman, Rideau & Mosgrove Sts., contemplates adding two additional storeys to a store.

Tenders will be called in about three weeks for a business block for C. R. Stephen. Burritt & Kingston, Hope Chambers, architects.

Owen Sound, Ont.
Plans are being prepared for a grain elevator costing $200,000 by MacDonald Engineering Co., 53 West Jackson Blvd., Chicago, Ill.

Sault Ste. Marie, Ont.
P. T. Rowland, 21 Summit Ave., will build a store block costing $8,000.

Shawinigan Falls, Que.
Belgo Canadian Pulp & Paper Co. Ltd., 51 St. James St., Montreal, will make an extension to paper mill. Raymond Concrete Pile Co. Ltd., Montreal, has the general contract.

Sorel, Que.
Tenders will be called shortly for an hotel costing $75,000. E. A. Doucet, 195 St. Catherine St. E., Montreal, architect.

Sturgeon Falls, Ont.
F. Beauchesne plans to build a store this spring which will cost about $7,000.

Toronto, Ont.
F. E. Wallace, 920 Danforth Ave., is excavating for stores, apartments and a garage to cost $12,000. Tenders being received for masonry, steel, roofing, electrical, plastering, etc.

E. Pullan Ltd., contemplates a garage. Kaplan & Sprachman, 298 Dundas St. W., architects.

A theatre and stores planned for the Runnymede district by M. Goodman at a cost of $20,000. P. L. Davis, 309 Gerrard St. E., architect. Tenders will be called shortly.

Until Mar. 24 Kaplan & Sprachman, 298 Dundas St. W., will receive tenders for a $15,000 addition to a factory for the Beaver Printing Co.

Vernon, B. C.
Store costing $5,000 contemplated by the Overweight Tea So., Vancouver. J. F. Moffat, Vernon, general contractor.

Walkerville, Ont.
Wm. Willmott, Windsor, Ont., is excavating for a $12,000 manufacturing building for H. Walker & Sons, Metal Products Co. Ltd., Kildare Rd.

CONTRACTS AWARDED

Brampton, Ont.
The contract for the construction of an addition to the factory of the J. W. Hewitson Co. Ltd., has been awarded to the Goldie Construction Co. Ltd., 32 Church St., Toronto.

Lakeview, Ont.
Lakeview Golf and Country Club Ltd., has awarded the general contract for an addition to the clubhouse, costing $10,000, to A. T. Avent, 56 Glendale Ave., Toronto.

Montreal, Que.
The general contract for stores for J. O. Gravel, Notre Dame St. W., awarded to G. Daoust, 801 Maplewood Ave., who will commence work in April.

Archambault & Leclair Ltd., 71a St. James St., have the general contract for a departmental store for Dupuis Freres, 444 St. Catherine St. E.

St. Hyacinthe, Que.
Victor Gervais, St. Hyacinthe, Que., has the excavating contract for a $50,000 factory.

Thetford Mines, Que.
Asbestos Corporation, Canada Cement Building, Montreal, has awarded the general contract for $500,000 mill to W. S. D. Cook, 10 Cathcart St., Montreal.

Residences

Kitchener, Ont.
Eight residences costing $40,000 are contemplated by U. B. Shantz, 35 King St.

London, Ont.
Plans are being prepared by Stuart Pavey, Standard Bank Bldg., for a $10,000 residence for Col. F. B. Ware, 476 Colborne St.

Tenders are wanted by W. H. Robinson, 203 Cheapside St., for a residence

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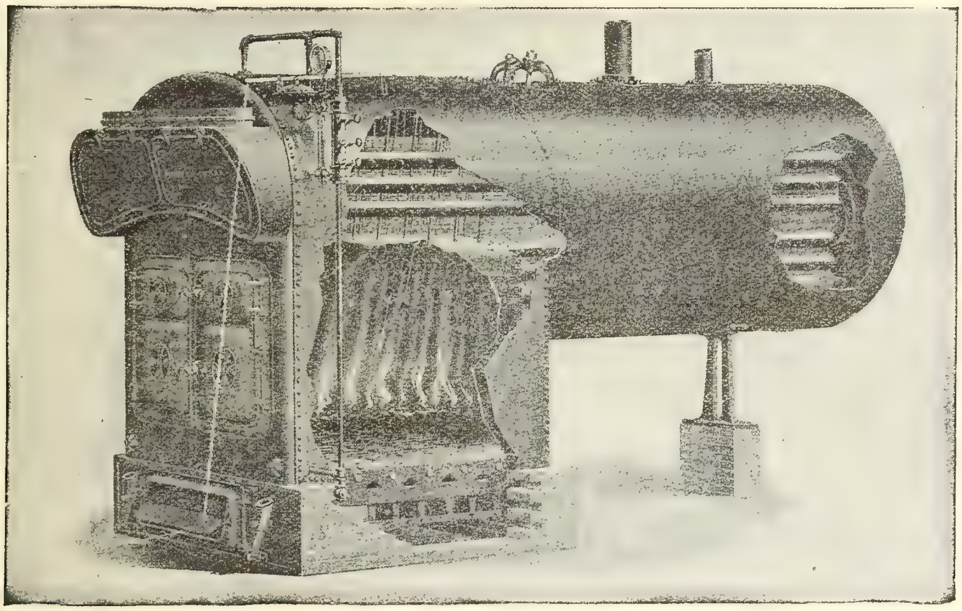

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costing $18,000. S. Stuart Pavey, Standard Bank Bldg., architect.

Tenders are being received by V. K. Greer, 86 Elmwood Ave., for a residence costing $8,000. Chas. Cox, [illegible], architect.

Residence costing $8,000 contemplated by R. W. Armstrong, C. P. R. Ticket Office. Is interested in prices of all materials.

Montreal, Que.

T. Marchand, 238 St. Zotique St., will shortly commence work on a residence costing $10,000.

Ottawa, Ont.

New tenders will be called shortly for a $10,000 residence for Col. L. P. Sherwood, 451 Daly Ave. Burrit & Kingston, 154 King Edward Ave., are the architects.

Tenders will be received until Mar. 24 by Noffke, Morin & Sylvester, Central Chambers, for apartments costing $18,000.

W. J. Browne, 142—3rd Ave., contemplates a residence costing $7,000.

W. Douglas, 173 Daly Ave., will call tenders on an $8,000 residecne. Work will proceed in May.

Outremont, Que.

J. E. A. Benoit, 1200 Wellington St., is preparing plans for an apartment house costing $100,000. Tenders will probably be called early in April.

Rimouski, Que.

Residence costing $15,000 contemplated by J. A. Brillant. Pierre Levesque, architect, 115 St. John St., Quebec.

Souris, P. E. I.

Tenders are being received until Mar. 23 for parochial house costing $10,000—$15,000. Rev. J. C. McLean, Souris, is receiving the tenders. C. B. Chappell & Hunter, DesBrisay Bldg., architects.

Tillsonburg, Ont.

Stanley E. Barrett, Tillsonburg, contemplates an apartment costing $12,000.

Toronto, Ont.

Tenders have been called by H. R. Watson, 36 Toronto St., for a residence costing $20,000. J. Royce Staunton, c/o architect, owner.

F. A. Tennison, c/o H. H. Tennison, architect, 145 Galt Ave., wants tenders on a residence costing $8,500.

About Sept. 1, T. W. Robinson, 11 Evelyn Cres., may commence work on an apartment house costing $50,000.

Harry J. Long, 76 Glendonwynne Ave., is excavating for a residence costing $9,500.

F. T. Quirk, 52 Dovercourt Rd., is excavating for a residence and garage to cost $18,000.

W. N. McEachren & Sons Ltd., 1801 Danforth Ave., have commenced work on forty residences. Painting, wiring, plastering, heating and plumbing to be let.

Waterloo, Ont.

Albert Herr, Albert St., contemplates a residence costing $7,000.

Windsor, Ont.

Six family residence contemplated by Frank Pickells, 1451 Dougall Ave. Cost will be about $15,000.

$35,000 apartment house contemplated by Laurent Jacques, 655 Sandwich St. J. P. Jacques, 3 Ouellette Ave., architect.

CONTRACTS AWARDED

Burlington, Ont.

J. D. Armstrong, Main St., Hamilton, is excavating for $25,000 house for H. Alexander, Burlington. W. L. Somerville, 45 Bloor St. E., Toronto, architect will let all other trades.

London, Ont.

Six residences costing $18,000 will be built for R. H. Smith, 193 Wharncliffe Rd. S., by A. Morrison, Beaconsfield Ave.

Outremont, Que.

Vulcan Steel & Iron Works, 1698 St. Dennis St., Montreal, has the contract for ornamental iron for the apartment house being built by I. Kauffman, 108 Laval Ave.

Toronto, Ont.

J. E. LeWars, 472 Lauder Ave., has the general contract for a residence for J. E. Ferguson, 8 Colborne St., which will cost about $12,000.

Cooper Bros., 308 Roxton Rd., have the general contract for a residence costing $15,000 for Mrs. Sivers. Beal & Thompson have the masonry contract and Alf. Keay Jr., 221 Howland Ave., the plumbing contract.

Windsor, Ont.

Plumbing and heating contracts for a $24,000 residence for Dr. P. A. Dewer, 501 Oullette Ave., awarded to White Plumbing and Heating Co., London St. W.

Contracts for plumbing and heating for $8,000 duplex residence awarded to J. R. Watson, Bruce Ave.

Power Plants Electricity and Telephones

Ford, Ont.

Wells & Gray are excavating for a power plant for the Ford Motor Co. Tenders for architectural trades will be called in about two weeks. Albert Kahn Ltd., architect.

New Watford, N. S.

British Empire Steel Corporation will enlarge present electric plant. Address, Canada Cement Bldg., Montreal.

Niagara Falls, Ont.

Tenders for a park lighting system will be received by John Jackson, superintendent, until Mar. 24.

St. Ours, Que.

St. Ours Electric Co. Ltd., Henri Delabarre, director, contemplates transmission lines in the counties of St. Hyacinthe, Vercheres, Richelieu and Yamaska. Roy & Taupin, 502 St. Catherine St. E., Montreal, engineers.

Miscellaneous

Cartierville, Que.

Plans are being prepared for an addition to Marlborough Golf & Country Club, Room 20, Mount Royal Hotel, Montreal. Barott & Blackader, Canada Cement Bldg., architects.

Halifax, N. S.

Tenders will be called about Apr. 1 for additions and alterations to the Halifax

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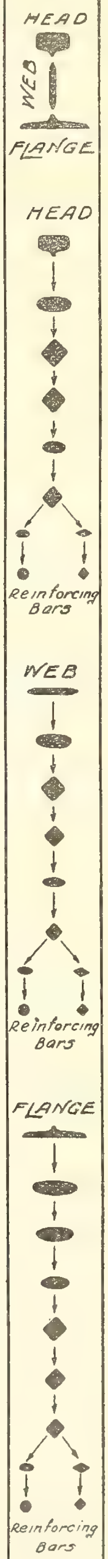
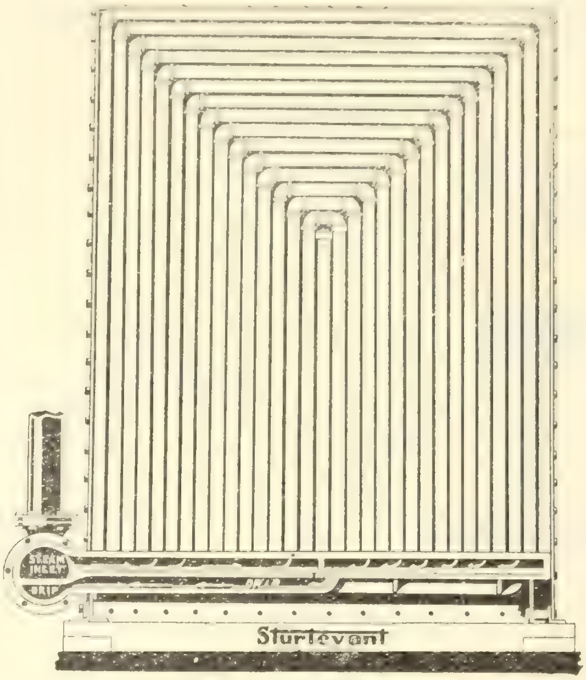
BEAMS, STIRRUPS, ETC.

We have every modern facility at our plant for bending to your schedule and will ship the bars to you, bent, cut to length and tagged.
We are the sole manufacturers in Canada of RAIL-CARBON steel bars and our product is in accordance with the American Society of Testing Materials Specification serial designation A-16-14.

· ACCURATE · AND · PROMPT · SHIPMENT · GUARANTEED ·





Avoid Expensive Heating Experiments

Consultation with Sturtevant engineers avoids the heating and ventilating experiments which prove so costly.

In each of the six distinct types of Sturtevant heaters warm air is kept in motion by means of a fan of correct capacity. No waste of heat through air becoming stagnant. Sturtevant engineers will tell you which Sturtevant installation will provide adequate heat and ventilation for your building at the minimum operation cost.

Write today for folder 606

B. F. Sturtevant Company
of Canada, Limited
Montreal - Galt - Toronto

Sturtevant
PUTS AIR TO WORK

Golf Club. S. P. Dumaresq, Royal Bank Bldg., Halifax, architect.

Hamilton, Ont.

Wentworth County Council contemplates having the Court House painted. Mr. Vance, clerk.

Lachine, Que.

H. Leblanc, [illegible] St. Joseph St., is building a boathouse costing $10,000.

Montreal, Que.

St. George & Gauvreau, 127 Stanley St., highway engineers, and general contractors have incorporated with a capital of $[illegible]

North Sydney, N. S.

Dominion Iron & Steel Co. Ltd., Sydney, will install an electric coal conveyor. Douglas Hives, Sydney, Purchasing Agent.

Ottawa, Ont.

Burritt & Kingston, Hope Chambers, Ottawa, are receiving tenders for a tennis court and pavilion to cost about $13,000.

Sault St. Marie, Ont.

The Dominion Government contemplates dredging which will cost about $15,000. W. J. Fuller, local engineer.

Fires

Montreal, Que.

Mountain St. Methodist Church destroyed by fire. Loss about $300,000. Rev. H. W. Burnett, 8 Torrance, pastor.

New Glasgow, N. S.

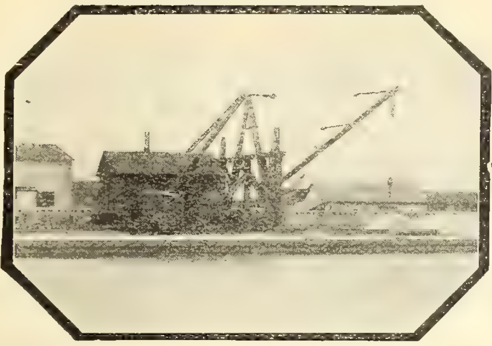
Canadian National Railways will rebuild station destroyed at a loss of $80,000.

To Improve Canadian Line

The Canadian division of the Pere Marquette Railroad Company will share in the $11,000,000 that has been appropriated for equipment and service improvements this year. The Canadian improvements include new all-steel passenger coaches and baggage cars and several new locomotives. The coaches are expected to be shipped here about the first of next month. A large amount has been set aside for ballasting work on the Canadian division this year and a new private telephone system is to be constructed. At the present time trains are despatched entirely by telegraph. The new depot at Sarnia is estimated to cost $40,000.

The Manufacture of Phonographs

As might have been expected, a considerable decrease in the manufacture of phonographs and other talking machines in the U.S. was shown in 1921 as compared with 1919, when the last previous survey of the industry was made. The value of products, including all accessories, in 1921 was $98,164,000, as compared with $158,000, a decrease of 38.1 per cent from 1919. The number of these machines made in 1919 was 2,227,000 and in 1921 only 596,000. The number of disc records, however, shows an increase of over 2,000,000, the figures being 101,085,000 in 1919 and 103,436,000 in 1921.



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Docks	**Foundations**
Canals	**Breakwaters**
Harbours	**Industrial Plants**

Above illustration shows travelling derrick handling 18-ton concrete blocks for Western Breakwater, Toronto Harbor Improvement Contract

Roger Miller & Sons, Ltd.

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Head Office: Lumsden Bldg., Toronto

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EXCAVATION
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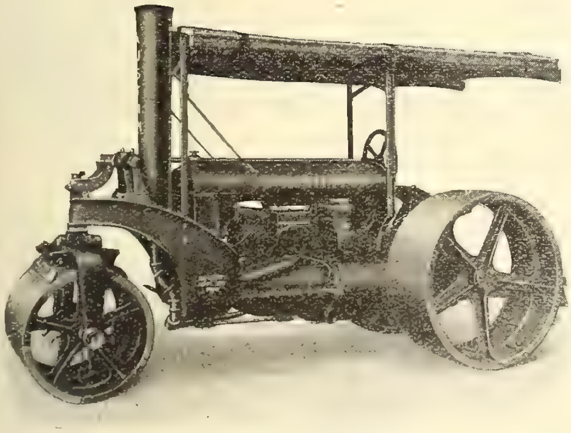


The AUSTIN Pup

A thoroughly efficient 3 ton, moderate priced Road Roller which does its work at a remarkably low cost for maintenance. It will do all the work of a light road roller, and besides, as a tractor, has ample power to pull a scraper, fresno, road machine or plow.

The economical operation of the Fordson Tractor is proverbial, and this wise combination of Austin Roller and Fordson Tractor permits not only of low first cost, but also cheapest prices for replacement parts.

Write our nearest branch for prices and full specifications.

The Canadian Fairbanks-Morse Co., Limited

St. John Quebec Montreal Ottawa Toronto Windsor Winnipeg
Regina Calgary Vancouver Victoria

44

Current Prices of Building and Engineering Materials

		Toronto	Montreal	Winnipeg	Vancouver
CEMENT (Delivered on job):—					
Retail lots including bags	per bbl.	$4.60	$4.16	$4.80	$3.70
Car lots, including bags	per bbl.	3.60	3.48	4.16	3.35
Refund on bags	each	.20	.20	.20	
LIME (Delivered on job):—					
Lump, in retail lots	per ton	14.30	14.00	.58 bu.	2.70 bbl
Lump, in car lots	per ton	12.70**	11.00	13.80 ton*	2.60 bbl
Hydrated, in retail lots	per ton	20.00	26.00	.60 bag*	30.00
Hydrated, in car lots	per ton	19.00	21.00	.54 bag*†	25.00
BRICK and TILE (Delivered on job):—					
Common face brick	per M.	21.00	16.50*	19.00	30.00
No. 1 dry pressed brick	per M.	31.00	30.00	36.00	70.00
No. 2 dry pressed brick	per M.	29.00	25.00	32.00	
Enamelled brick	per M.	125 up to	230.00	185.00	150.00
Wire cut brick, for foundation work	per M.	21.00	19.00		50.00
Sand lime brick	per M	17.00		18.00	
Hollow building tile	per M.			8-12c. per ft.	105-240.00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	60-95	60-75	85-100	80.00
Fire clay	per ton	13-20	15-16.00	35.00**	22.00
STONE, SAND and GRAVEL (f.o.b. cars on siding):—					
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.00 yd.
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 "	" "
Crusher run	per ton	2.20½		3.00 "	" "
Rubble stone	per ton	2.45	1.70	15.00 cord	" "
Gravel, 2 in. screened	per ton	2.05		2.45 yd.	" "
Gravel 1 in. screened	per ton	2.31	1.50	2.75 "	" "
Sand, screened	per ton	1.42½	1.25	1.90 "	" "
Pit run	per ton	1.52¾	1.25	1.90 "	" "
STEEL and IRON (f.o.b. warehouse):—					
Mild steel bars, ¼ in. and heavier	per 100 lbs.	3.75 base	3.50 base	4.35	$4.00
Bands 3/16 in. and lighter	per 100 lbs.	4.25 "	3.50 "	4.85 base	
Hoops	per 100 lbs.	5.00 "	4.50 "		
Twisted and deformed bars	per 100 lbs.	3.75 "	3.50 "	4.20	4.00
Angles, channels and tees under 3 in.	per 100 lbs.	3.90 "	3.75 "	4.95	6.00
Structural shapes	per 100 lbs.	4.00 "	3.75 "	4.75	6.00
Plates—¼ in. and heavier	per 100 lbs.	4.00 "	3.75 "	4.75	6.25
Plates—3/16 in.	per 100 lbs.	4.35 "	4.10 "	5.15	6.50
Plates—10 gauge	per 100 lbs.	4.40 "	4.50 "	5.45	6.50
Black sheets—28 gauge	per 100 lbs.	5.50 "	5.00 "	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.65 "	7.00 "	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	6.65 "	7.00 "	7.70	8.25-8.50
Rivets	per 100 lbs.	6.25 "	6.00 "	7.00 base	
Cast iron pipe	per ton	65.00	60.00		
VITRIFIED CLAY PRODUCTS (Delivered on job):—					
Sewer pipe, 4 in.	per ft.	.40	.30	.35	.28
Sewer pipe, 6 in	per ft.	.60	.45	.45	.48
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.55
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.70
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.85
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00	.90	.65	.75
Chimney tops	each	9.00	3.50–5.00	7.50	4.50–6.00
Discounts		45 % truck lots	20 %		
		50 % car lots	50 %	5 %	

CEMENT:—*Discount of 10 cts. per bbl. in 20 days. Price f.o.b. cars is $3.75 †Subject to 5% discount. **Excluding bags.
LIME:—*Discount of 5%. †Bag of 50 lbs. **Price f.o.b. cars is $11.70.
BRICK AND TILE—*f.o.b. plant.
STONE SAND AND GRAVEL:—*Winnipeg prices subject to 5% disco **Toronto prices include sales tax.

LIMESTONE

(Rough, Dressed and Pulverized)

Our Plant is equipped with the most modern machinery,
enabling us to fill the largest orders without delay

Specialty: Pulverized Stone Dust Filler for Asphalt Paving Purposes

DESCHAMBAULT QUARRY CORPORATION

Head Office: QUEBEC, P. Q. Works: ST. MARC, Portneuf Co.

FOR SALE

Contractors' Equipment

100 ft. Lakewood Concrete Chute with Hoppers complete, Sale price $600.00

1 Concrete Electric Grinder for trimming and smoothing concrete surfaces Sale price $150.00

4—1½ ton Ford Trucks with Lee Dump Concrete Bodies. Good condition, only used three months Sale price $475.00

1 Ingersoll Rand Air Compressor complete Sale price $300.00

1 Wettlaufer Half-yard Concrete Road Mixer Sale price $1000.00

1—6" Discharge Centrifugal Pump Sale price $150.00

1 Hepburn Stiff Leg Derrick 30 ft. boom Sale price $225.00

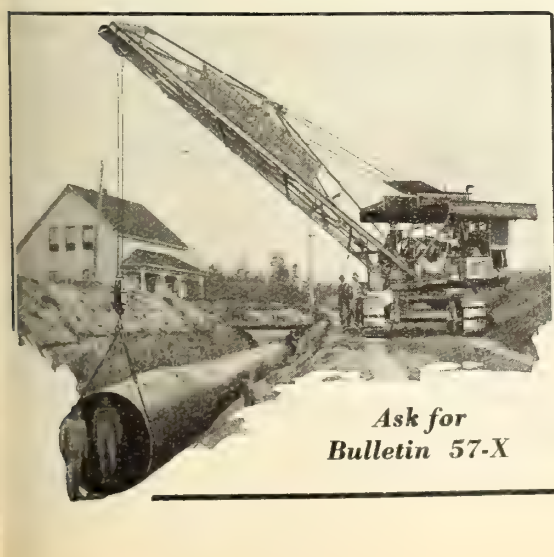
100 ft. Heavy Bucket Conveyor made by Canadian Link Belt Co. Sale price $600.00

100 ft. Heavy Bucket Conveyor made by Climax Good Roads Machy. Sale price $500.00

Apply—

FRID CONSTRUCTION COMPANY, LIMITED

CLYDE BLOCK, HAMILTON, ONT.



Ask for Bulletin 57-X

This P & H and One Operator Reduced the Pipe Gang

Eight to fourteen of these pipe sections, varying in weight from 4 to 8 tons were laid per 8-hr. day by this P & H 206.

Because of the strength of the P & H structure, they stand up under all kinds of service, travel through ditches, up steep grades, over uneven and soft ground. This is an important point for every contractor to consider. The machine you want—which will give you service next year as well as this, with low maintenance and repair costs—is the P & H.

Excavating Machinery Division

PAWLING & HARNISCHFEGER COMPANY

Established in 1884

3811 National Ave., Milwaukee, Wisc.

PAWLING & HARNISCHFEGER CO. P AND H EXCAVATORS

CURRENT PRICES OF BUILDING AND ENGINEERING MATERIALS— continued

Lumber (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver*
Flooring, 1 x 3 and 4 in., clear, E. G. fir	per M.	90.00	60.00	84.00	55.00
Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	70.00	65.00	56.00	30.00
Flooring, No. 1 pine	per M.	70.00	80.00	64.80	
Flooring, No. 1 Spruce	per M.	48.00	45.00	39.60	
Flooring, birch and maple, 13/16 in. clear	per M.	130.00	110.00	152.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	130.00	125.00	140.00	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	70.00	65.00	56.00	30.00
V joint, No. 1 pine	per M.	70.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	43–58	45.00	63.75	
Red and Jack Pine, 2 x 4 to 12 in., com. rough	per M.	44/58	70.00	36.00	
Hemlock, 2 x 4 to 12 in.	per M.	40/44	40.00	36.00	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	40–50.00	50.00	36.00	11.00-13.50
Spruce, 1 and 2 x 4 to 12 in.	per M.	44/58	45-35	36.00	
Timbers, fir, 10 x 10 in. and up	per M.	63.00	60.00	47.00 base	17.-22.00
Lath, No. 1 white pine	per M.	16.00	12.00	12.00	
Lath, M. R. spruce	per M.	10.00	8.50	10.00	7.00
Shingles, XXX B.C. cedar	per M.	6.50	5.00	5.25	3.40
XX B.C. cedar	per M.	5.00	4.25	3.75	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	108.00	55.00
Fir casing	per M.	1 ct. per in.	100.00	108.00	
PAINTS, OILS, COLOURS (delivered):—					
White lead ground in oil, less than ton lots	per cwt.	14.55	13.75	14.85	15.80
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	22.00
Putty in bulk	per cwt.	5.45	4.25	5.50	9.35
Steel sash putty in bulk	per cwt.	5.95	6.00	8.75	7.75
Boiled linseed oil, in bbls.	per gal.	1.23	1.18	1.13	1.28
Raw linseed oil, in bbls.	per gal.	1.20	1.16	1.10	1.25
Turpentine, in bbls.	per gal.	2.20	2.00	2.15	1.60
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 4/5	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 1/5	.45
PLASTER (Delivered):—					
Hard wall plaster, sanded	per ton	13.50	15.00	25.00	30.00
Plaster of paris, in bbl. lots	per bbl.	6.00	5.35	1.60 bag*	7.50
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu.	1.50
LABOR:—					
Bricklayers	per hr.	1.00	.80–.90	1.15	1.06¼
Structural Iron Workers	per hr.	.85	.50–.75	1.25	1.00
Plasterers	per hr.	1.00	.80	1.05	1.06¼
Hoisting Engineers	per hr.	.70–.80	.50	.90–1.10	1.00
Plumbers	per hr.	.90	.60–.75	1.00	.90
Carpenters	per hr.	.80	.65	.90	.81¼
Painters	per hr.	.75	.55–.65	.80	.81¼
Electrical Workers	per hr.	.80	.65	.70– .90	1.00
Roofers	per hr.	.65	.65		.90
Laborers	per hr.	.40–.50	.30	47½–.55	.50–.56¼
Sheet Metal Workers	per hr.	.75			.90

LUMBER:—*Owing to the general unstable condition of the present lumber market, Vancouver dealers refuse to quote any prices at all especially for Prairie or Eastern publication. The prices are, moreover, fluctuating from day to day. Such prices as we quote are, therefore, averages and not standard.

PLASTER *Including bags.

SCREEN GRAVEL
PEA GRAVEL
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Rapid Truck Delivery. Just Phone
Beach 1128 or 1780

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STOP 19, KINGSTON ROAD
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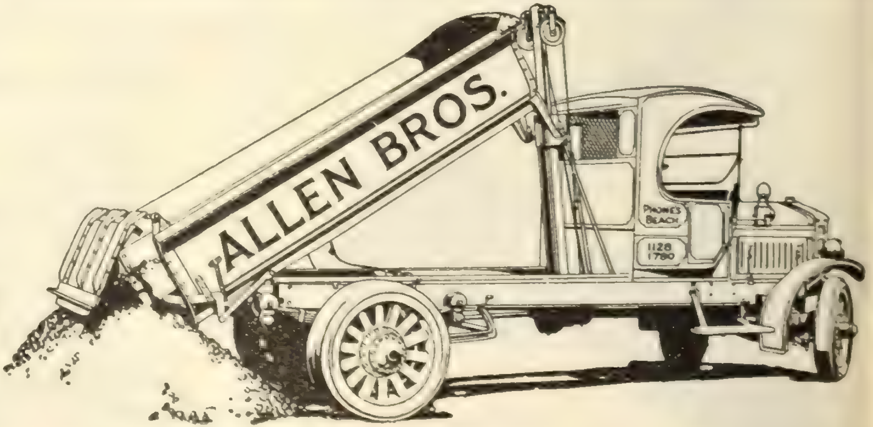

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on

Gymnasiums, Locker Rooms, Baths for Clubs, Schools or Public Buildings

DURING nearly half a century we have specialized in the manufacture of gymnasium, locker room and swimming pool equipment. The experience gained, compiled in book form, is available for any architect. This data is most comprehensive and complete giving details and drawings.

We would suggest that in planning either club, school or industrial building you avail yourself of the invaluable Medart Engineering Service.

JOHN G. COFFEY

REPRESENTATIVE

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Fred Medart Mfg. Co. - - St. Louis, Mo.

IF EXPERIENCE IS AN ASSET you are ASSURED of the benefit of it in any ROAD MAKING MACHINERY you purchase from the SAWYER-MASSEY COMPANY

Double Cylinder Steam Road Roller

Our line is complete—
Portable Rock Crushers.
Elevators, Screens and Portable Bins, 3 sizes.
Gravel Screening Plants.
Road Graders, 4 sizes.
Scarifiers, heavy and light.
Road Drags and Road Planers.
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Branches and Warehouses— Winnipeg, Regina, Saskatoon, Calgary

Use CANADIAN Plaster

BUT SPECIFY

“HAMMER” BRAND

Hard Wall Plaster
Calcined Plaster

Manufactured by

ALBERT MANUFACTURING CO.

HILLSBOROUGH, NEW BRUNSWICK

Our plasters have stood the test of time for over fifty years

Hydrated Lime Banner Brand

Manufactured from the Celebrated Guelph White Lime

High Calcium Lime for Chemical Purposes

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Crushed Stone, all Sizes

Crushing Plant at Beachville

Standard White Lime Co. Limited

Head Office: GUELPH **Plants: Guelph, Beachville St. Marys**

Building Contractors--

YOU can now purchase grey lime, hydrated, and packed in handy 50 lb. paper sacks which eliminates the necessity of a slaking bed, saves time and labor, and ensures a better working mortar.

Write for full particulars to

Melville Quarry Co., Limited

Manufacturers of Crushed Stone and Grey Hydrated Lime

NOTE OUR NEW ADDRESS

Head Office, 169 Yonge St. TORONTO

Phone Main 6372

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STONE - SAND - GRAVEL

Prompt Delivery

Rogers Supply Company Limited

Toronto, Canada

Adel. 4318 **Adel. 6900**

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Montreal Crushed Stone Company, Limited

Plant at St. Vincent de Paul, P. Q., on River des Prairies, opposite Montreal

Largest Plant in CANADA and the most up-to-date in the World

CAPACITY 4000 TONS A DAY

All Sizes and Grades of the Best Hard Lime Crushed Stone Produced

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SAND LIME BRICK

Contractors and architects who order from us do so with the knowledge that their order will be filled on time. We guarantee this service by keeping a reserve stock constantly on hand and will not accept orders that will deplete this reserve. This means that you get delivery when you want it.

Quality—the finest ***Prices—right***

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In the use of ***Canadian Materials***

Queenston Blue Dolomite

A Canadian Stone
of
Superior Quality and Color

Will not Stain
Retains its Bright, Clean Appearance

Ashlar, Dimension Blocks, Sawn Slabs, Sawn Dimension and Cut Stone.

Estimates cheerfully furnished
Send for samples and prices

Queenston Quarries Ltd.
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CRUSHED STONE LIME SAND

STANDARD LIME COMPANY
LIMITED

JOLIETTE, QUE.

LARGEST PRODUCERS OF LIME IN CANADA

PLANTS

CRUSHED STONE	LIME	SAND
JOLIETTE, QUE. C.N.R. & C.P.R.	JOLLIETTE and ST. MARC, QUE. C.N.R. & C.P.R.	ST. FELIX DE VALOIS, QUE. C.P.R.

GRANITE

Rough Stock - Monumental
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BRODIE'S LIMITED
128 Bleury St.
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Stanstead, Ebony and Brodie's Pink Granites

Quarries at:—Graniteville, Mount Johnson, and Guenette, Que.

Stock of Paving Blocks always on hand ready for immediate shipment

PARIS SAND & GRAVEL
COMPANY

Washed Concrete Sand
Dry Screened Concrete Sand
1" Washed Screened Gravel
2" Washed Screened Gravel

We make a speciality of Pit Run Gravel, in fact we can give you what you want.

Capacity 30 cars per day.

RURAL ROUTE No. 2
PARIS, ONT.

Largest and Best Equipped Plant in Ontario

As evidence of our desire to give customers the highest grade product and the best service, we have installed the most modern equipment known to the industry.

A daily output of 3500 tons is being achieved and the stone, all sizes, comes clean and even in size.

Write, wire or phone your orders for quick action

Canada Crushed Stone Corporation
DUNDAS Limited ONTARIO
Exclusive Agents:—John E. Russell Co., Ltd. Phone Adelaide 1600

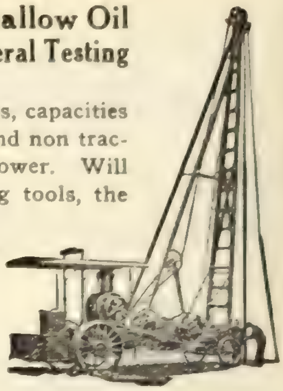
Cyclone Churn Drills

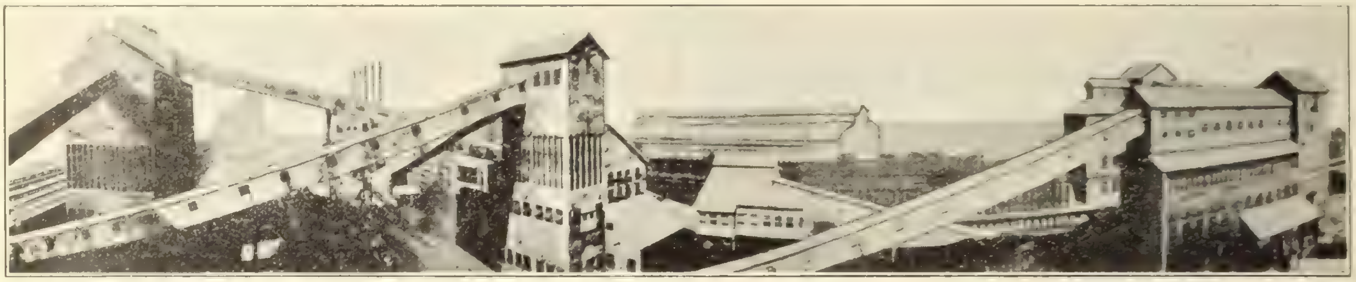
For Blast Hole, Water, Shallow Oil and Gas Well Drilling and Mineral Testing

The No. 14 Cyclone Blast Hole Drill is a machine especially designed and constructed for drilling blast holes in quarries, open pit mines and for heavy rock excavation. Built in two sizes in both traction and non traction types with gasoline, electric or steam power. Covered in our Catalog B-45.

Cyclone Well Drills are built in 5 sizes, capacities 200 to 2000 feet and in both traction and non traction types with gasoline or steam power. Will operate cable and hollow rod drilling tools, the latter by either the self-pumping or jetting process. Well Drills are described in our Catalog A-70.

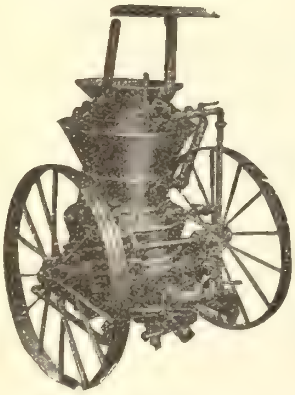
The Sanderson-Cyclone Drill Co., Orrville, Ohio, U.S.A.
Mussens Ltd., Canadian Representatives — Montreal, Toronto, Winnipeg and Vancouver





Coke-handling plant at River Rouge on which Gunite Walls were specified and used

"What is the Secret of Henry Ford's amazing Success?"



The Cement-Gun is not a restricted article. It may be purchased from us and used by anyone.

FROM a circular letter, issued by INDUSTRIAL MANAGEMENT, whch reached our desk recently, we abstract the following:

> "River Rouge is Ford at his greatest. It epitomizes all of the things which Ford and his engineers have found successful during twenty years of phenomenal and unparalleled industrial achievement."

It is with some pride, therefore, that we refer to Mr. Ford's varied uses of the Cement-Gun.
Would you like to tell you how the Cement-Gun can be applied to your needs?

CEMENT - GUN COMPANY, INC.
ALLENTOWN, PA.
New York, Pittsburgh, Chicago, Sioux City,
Los Angeles, Seattle

Agents in Eastern Canada: General Supply Company of Canada, 356 Sparks Street, Ottawa. Foreign Agency International Cement-Gun Company, Ziest, Holland

FOR SALE

2—72″ x 18′ Deane H.R.T. boilers 145 lb. working pressure.
1—Type O Thew steam shovel 5/8 yard dipper, traction wheels.
1—3/4 yard Erie, condition as good as new, high lift boom with boom hoist.
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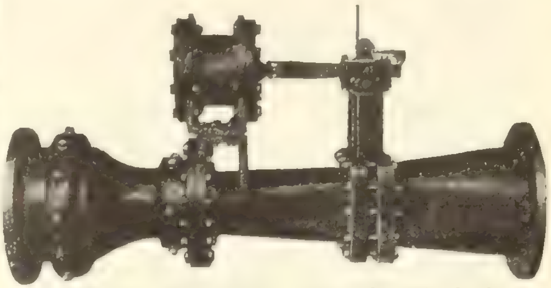

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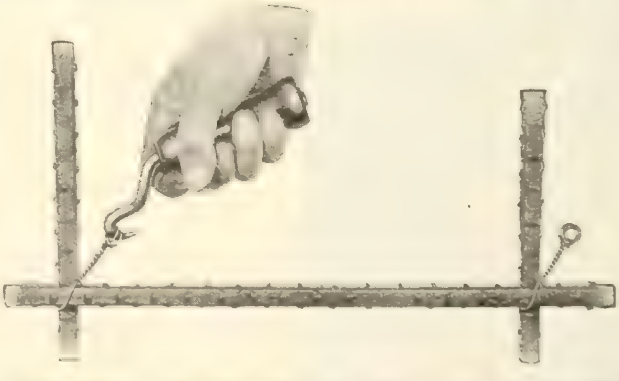

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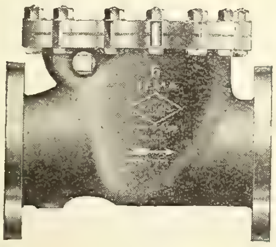

Fig. 481

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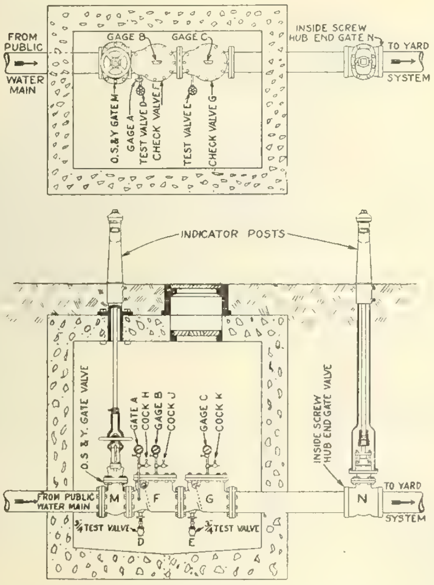

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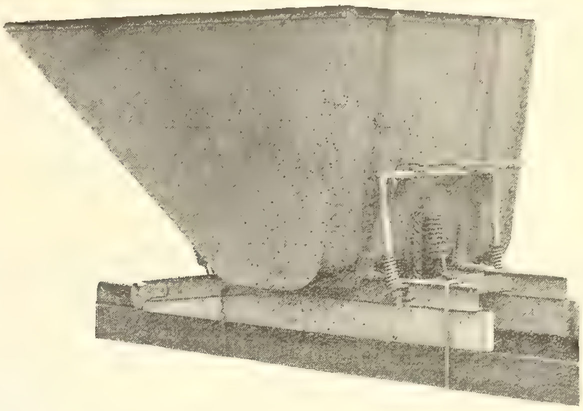

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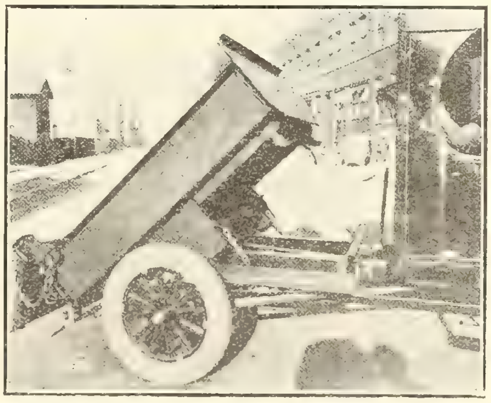

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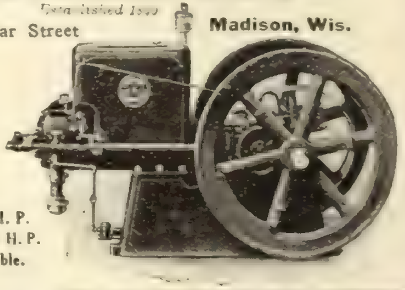

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Section 300

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The travelling expenses in connection with the inspection of Boilers sold, exchanged or extensively repaired, must be paid by the owner or purchaser of such Boilers, together with the inspection fee of five dollars.

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HON. W. R. ROLLO,
Minister of Labour.
D. M. MEDCALF, Chief Inspector of Steam Boilers.

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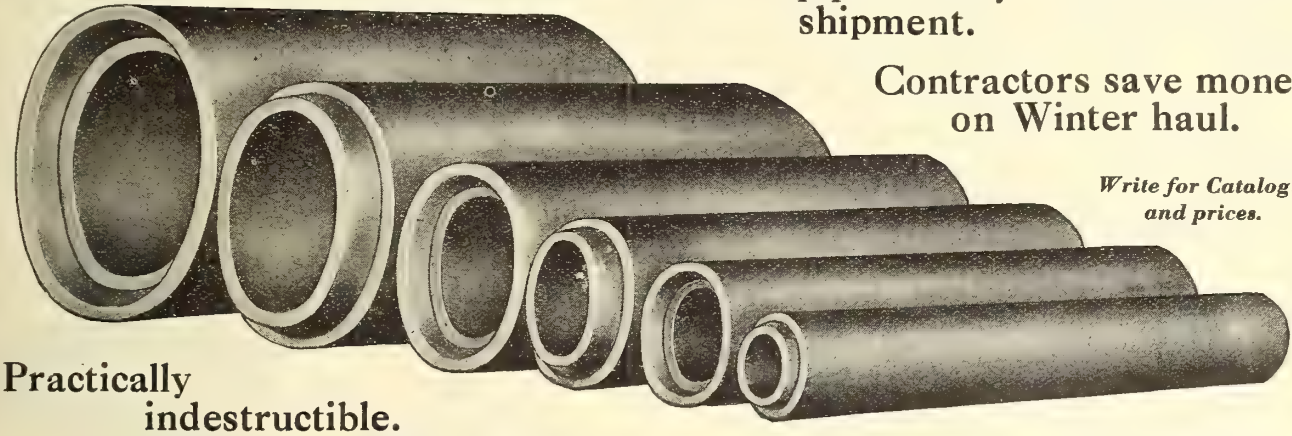

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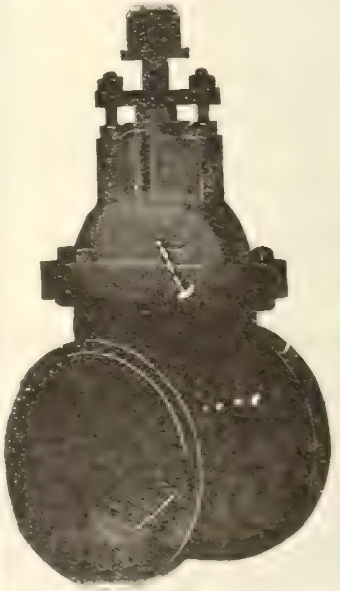

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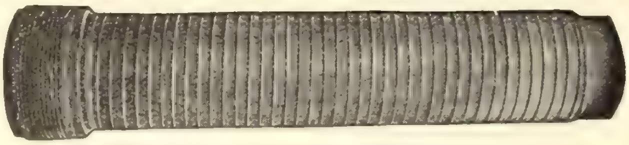

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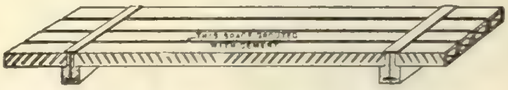

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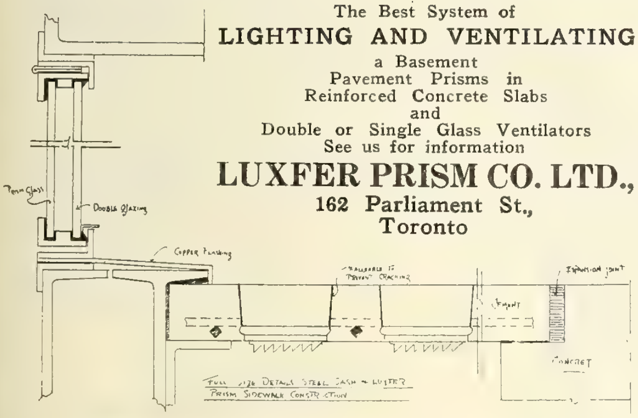

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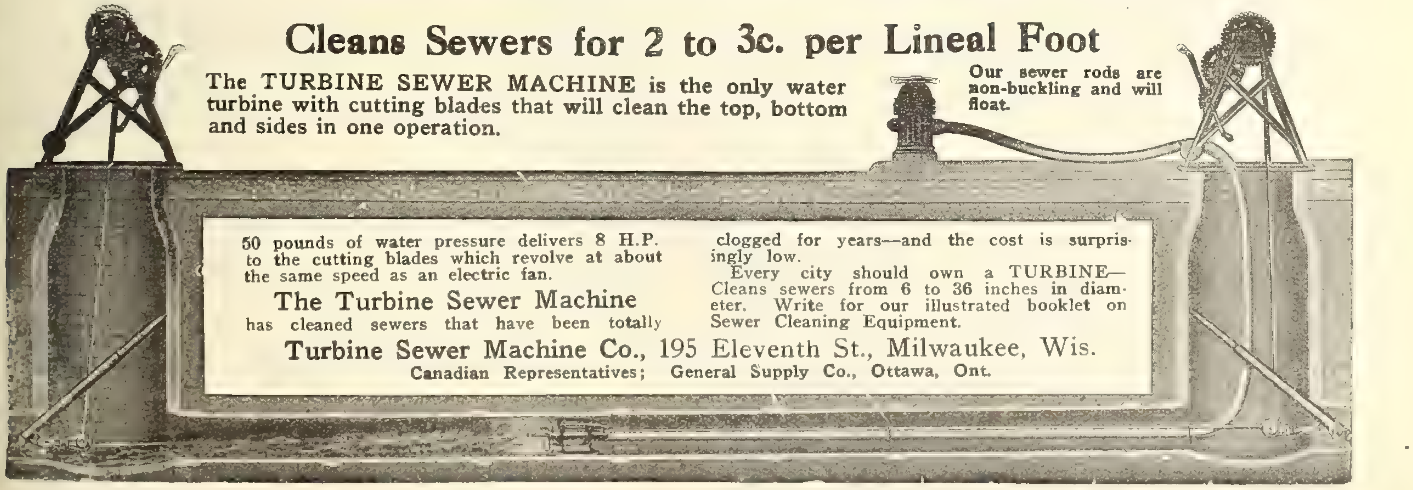

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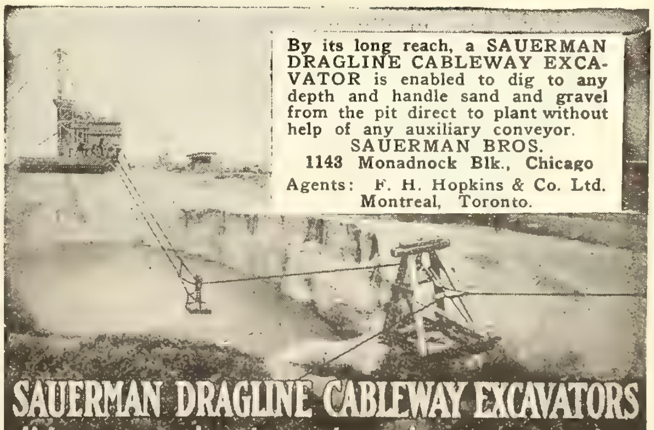

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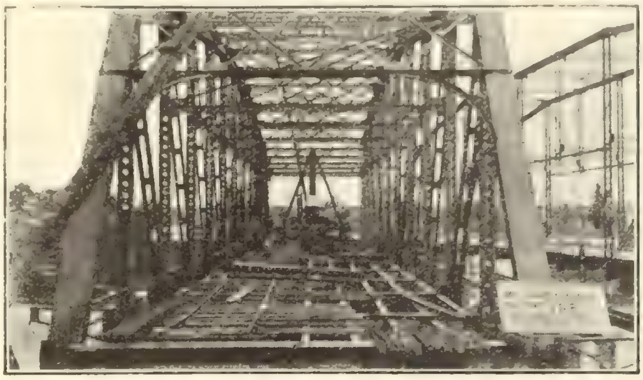

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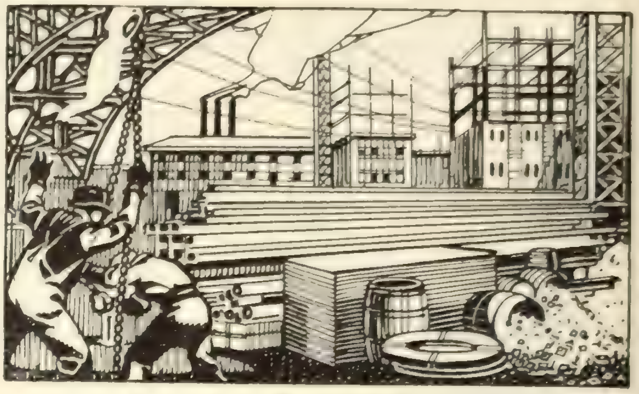

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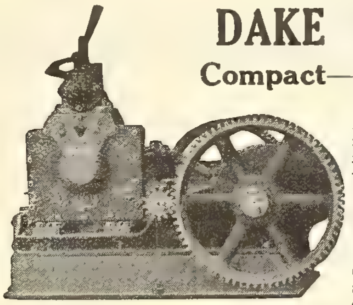

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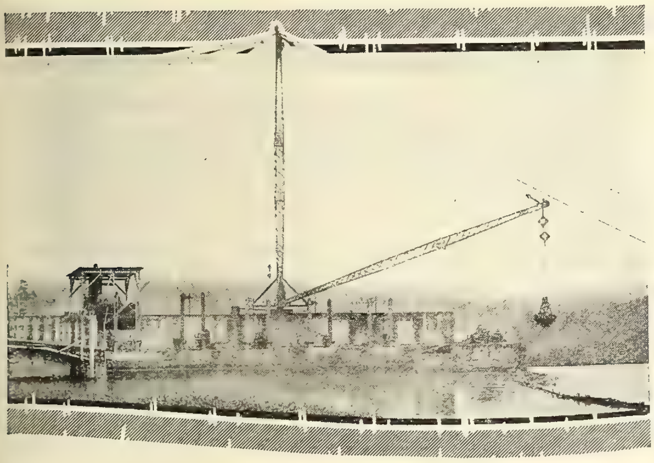

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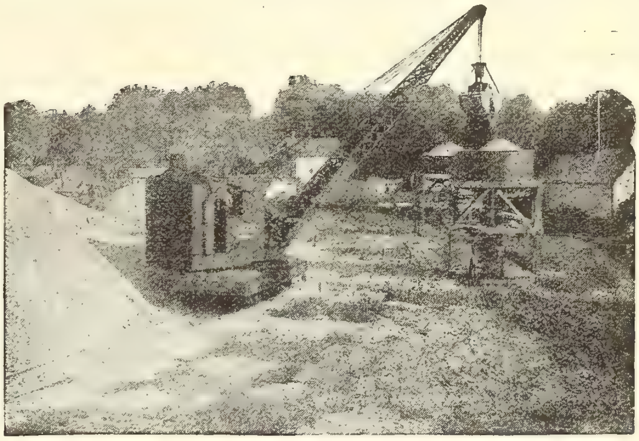

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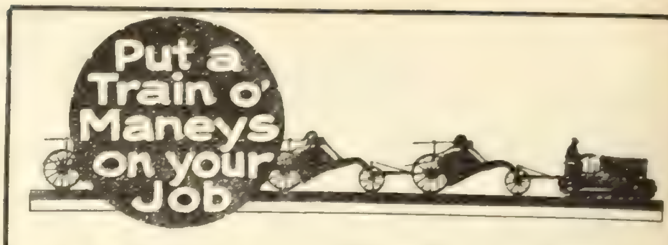
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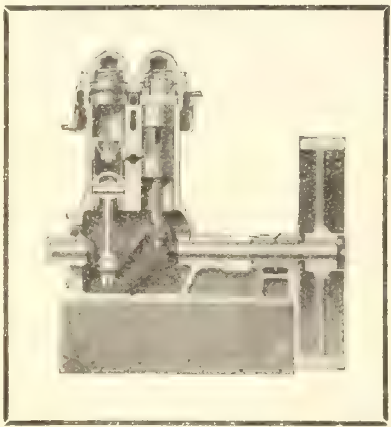

Section of YORK Enclosed Ammonia Compressor showing simplicity of construction

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Ammonia Compressors
are designed and constructed
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which requires a Refrigerating Machine of moderate initial cost, that is reliable under all conditions—does not require a skilled operator, nor an experienced mechanic to make repairs. Although the necessity for repairs is almost negligible, it is realized that wearing and bearing parts must deteriorate eventually. All parts of York Enclosed Compressors are made to jigs and templates, insuring the fit of repair parts. The simplicity of construction makes it possible for any employee to take care of a York Refrigerating Machine.

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We specialize in the construction of wire rope for every requirement. Years of experience warrant us stating frankly that we offer the best to be obtained.
If you want wire rope that can be absolutely depended upon to give the most economical results, we ask you to specify "Dominion."
We carry a complete stock of all classes and sizes for prompt shipment.

Blocks — Clips — Thimbles — Turnbuckles, Etc.

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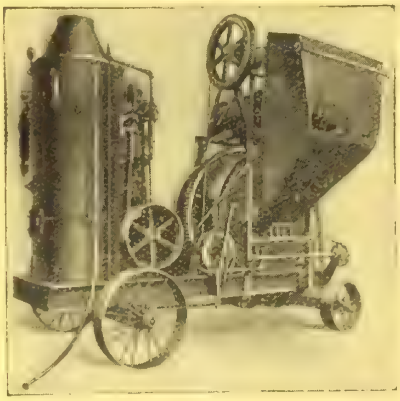

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Vol. 37 Toronto, March 28, 1923 No. 13

Contract Record and Engineering Review

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1551 Granville Street
Established 1904
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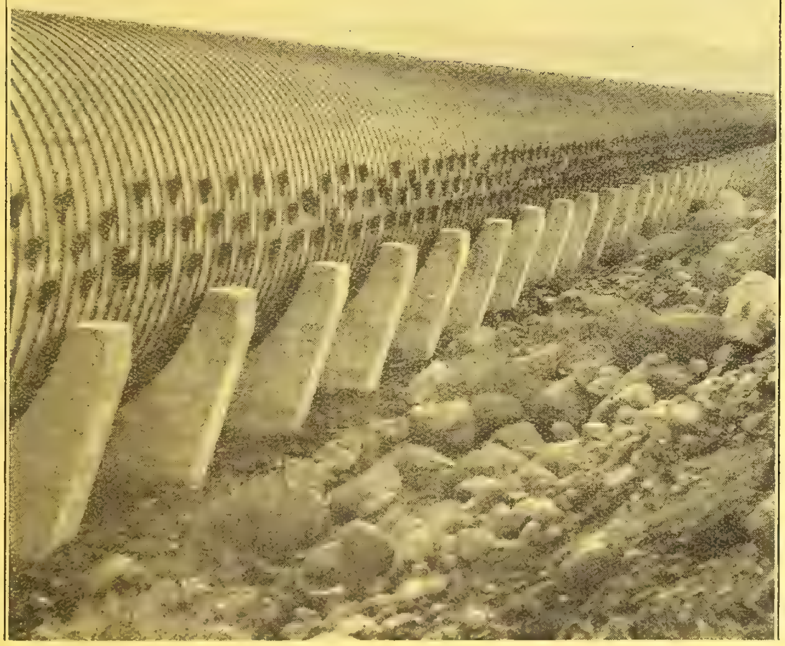
The benefit of years of experience in Wood Stave Pipe installation is at your service

Write us for Catalog and Estimates



11 ft. dia. Pipe with Special Concrete Cradles

The Combination of Wood Stave Pipe and Concrete Cradles we illustrate here stand for Durability and Economy

Wood Stave Pipe

Wire Wound Pipe
2 to 24 inches diameter

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16 inches to 14 feet diameter

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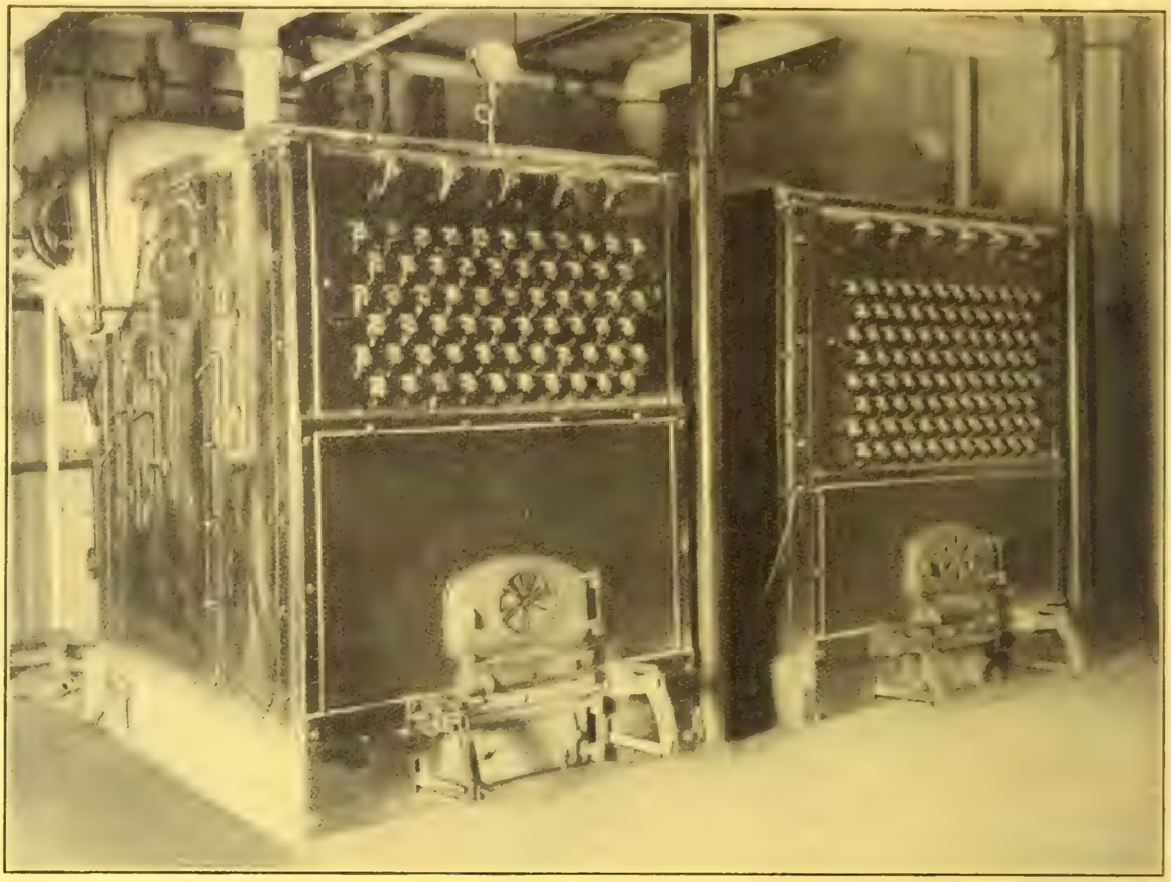

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TYPE "H"

Water Tube Heating Boilers

Are designed to efficiently and satisfactorily Heat all kinds of Public Buildings such as Schools, Churches, Business Blocks, etc.

Recent Installations include:—The Ottawa Collegiate; Ottawa Citizen Bldg; Rockliffe School, Ottawa; La Corona Hotel, Montreal; Kitchener-Waterloo Collegiate; County Court House, Ottawa; Guelph Collegiate; Laroeque's Store, Ottawa; McIrvine Block, Galt; Kitchener Y.M.C.A.; Galt Y.M.C.A.; G. Ruppel & Co., Kitchener; Dominion Shirt Co., Kitchener; The Hurlbut Company, Preston.

Illustration shows the Kitchener Y.M.C.A. Installation

Ask for Circular, Prices, etc.

Office of J. ALBERT EWART, B.A.Sc,
Architect,
Jackson Building,
Ottawa.
February 6th, 1923
The Goldie & McCulloch Co. Limited,
38 Monk Street, Ottawa, Ont.

Dear Sirs:

Answering your letter of February 5th, regarding the type "H" Water Tube Heating boilers which have been recently installed at the Ottawa Collegiate Institute, I beg to state that these boilers have been in operation since the beginning of the winter and are giving entire satisfaction. I made inquiries to-day as to how they were working and Mr. Pearce reported that they were doing fine. As you are aware this was an exceptionally cold morning and it is a pleasure to know that we have a heating plant that can handle everything it is called upon to do without trouble.

This type of boiler we find to be a very fast steamer, so that the fireman can heat the building very quickly at any time when the fire happens to go down.

I should be very glad to recommend this type of boiler to any of your clients.

Yours very truly,
J A E/V M C K J. A. EWART.

NOTE:—Tuesday, Feb. 6th, 1923. The morning referred to above temperature registered 24° below zero.

The GOLDIE & McCULLOCH CO. Limited

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"BECAUSE"

they are designed to run continually. Breakdowns and repairs put the contractor out of business.

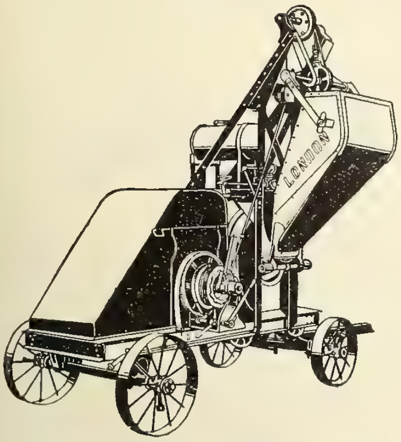

Fig. 33
London Heavy Duty Mixer with Gasoline Power

Fig. 19 illustrates the London Concrete Mixers, Nos. 4 and 6. Designed for building culverts, bridges, sidewalks, foundations, silos or any work requiring a portable mixer with a capacity up to 60 cu. yards per day. Described in Bulletin 49-C-D.

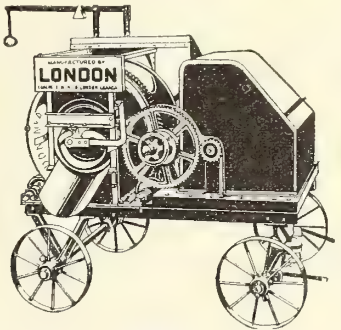

Fig. 19
London Concrete Mixers, Nos. 4 and 6

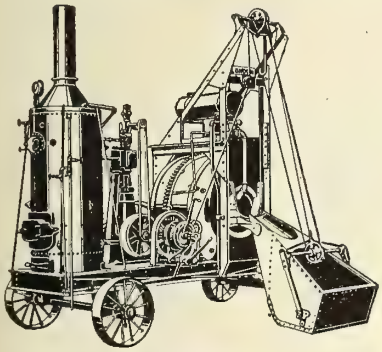

Fig. 39
London Heavy Duty Mixer with Steam Power

Fig. 33 and 39 illustrates the London Heavy Duty Concrete Mixers, built in five sizes and in capacities from 90 to 300 cu. yards per day. Described in Bulletin 49-F-1.

Fig. 814 illustrates the London Gem Concrete Mixers. Made in two sizes, Nos. 3 and 5. Especially suitable for small contracts. Capacities up to 50 cu. yards per day. Described in Bulletin A-3.

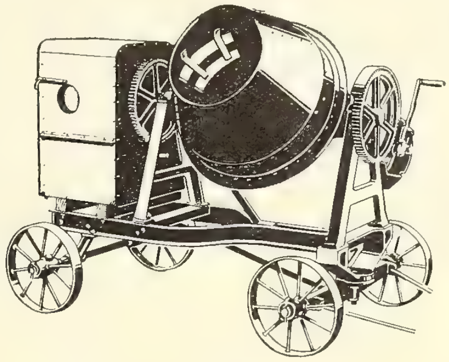

Fig. 814
London Gem Concrete Mixers Nos. 3 and 5

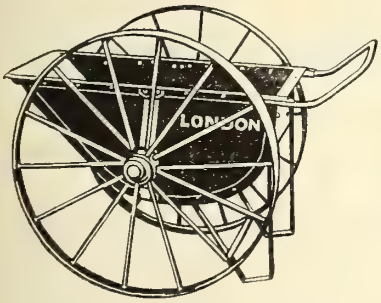

Fig. 83
London Concrete Cart, No. 6

Fig. 83 illustrates the London Concrete Cart No. 6. The load is correctly balanced. No weight on the operator's arms. Dumps easy and clean. High grade construction. Described in Bulletin O.

Made in Canada

We manufacture Concrete Mixers, Hoists, Air Compressors, Pumps, Brick, Block and Tile Machines, Barrows, Carts, Silo Moulds, Ornamental Moulds and Tools.

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Dept. 7 London, Canada

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Contract Record and Engineering Review

349 Adelaide Street West, Toronto

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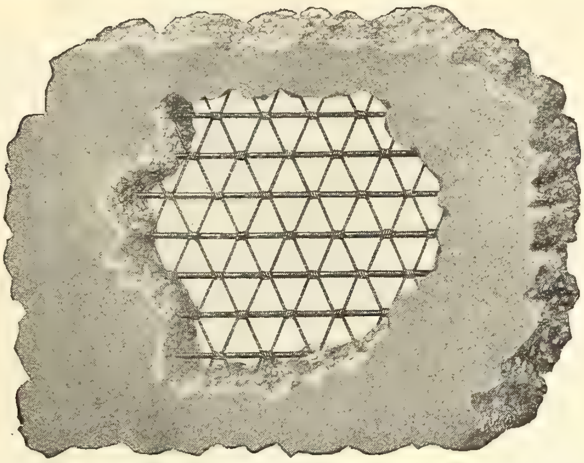
with
Triangular Mesh Reinforcement

Engineers select materials entering into any class of construction for the service those materials are to perform. Selection is based upon known characteristics or properties.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A concrete highway has to stand more than almost any other form of construction, because of the heavy motor traffic, abrasion and frost. It is equal to the heaviest work by reinforcing with steel.

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Hamilton, Canada

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Sturtevant, B. F. & Co.

Electric Water Systems
H. Mueller Mfg. Co., Limited

(Continued on page 8)

Pig Lead to Elephant Lead

Good Canadian Pig Lead—specially refined and desilverized bars, melted and blown into infinitely small atoms, whitened by the fumes of acetic acid and carbonic acid gas, crushed by powerful steel rolls, ground fine enough to float in water, bolted through a fine silk screen, washed, dried and ground in pure Linseed Oil—that, in brief, is how **ELEPHANT WHITE LEAD** is made.

Wonderfully white, wonderfully smooth and with great covering power, **GENUINE ELEPHANT** is the most popular White Lead in Canada.

There is a genuine pleasure in using **ELEPHANT WHITE LEAD.** Its use assures a satisfactory finished job and adds to the reputation of the contractor using it.

"Save the surface and you save all"-Paint & Varnish

THE CANADA PAINT CO.

LIMITED

Makers of the famous
"Elephant" Brand Genuine White Lead

MONTREAL TORONTO HALIFAX WINNIPEG CALGARY VANCOUVER

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Elevators
Canadian Link-Belt Co.
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Laurie & Lamb
Le Roy Company
Sterling Engine Co.
Waterous Engine Works Co.

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Hunt & Co., Robt. W.
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Lumsden Engineering & Contracting Co.
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Mussens Limited
Thew Shovel Co.

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Sturtevant, B. F. & Co.

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Fans, Disc
Sturtevant, B. F. & Co.

Fans, Multivane
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Fans, Propeller
Sturtevant, B. F. & Co.

Fans, Silentvane
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Hepburn, Ltd., John T.

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Standard Lime Co.

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Canadian Ingersoll Rand Co.
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Canadian Equipment Co.
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(Continued on page 10)

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Canadian Steel & Wire Co.

Reinforcement Ties
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Canadian Johns-Manville Co.
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Mussens Limited
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Steel Curb Forms
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[illegible]
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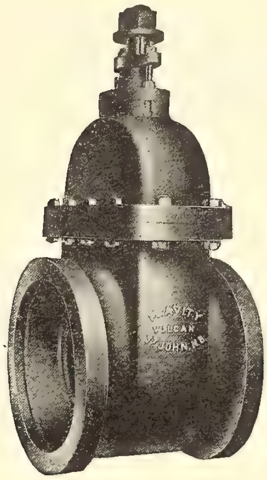
The Service Valve

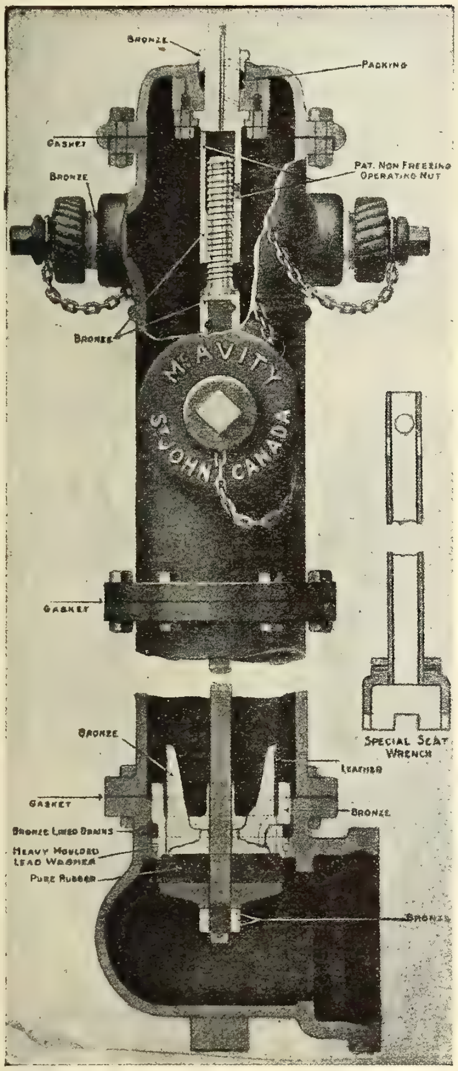


Standardized

Fire Hydrants

and

Water Gates



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The House of Worship

The church of NATCO Hollow Tile has many advantages, economies and comforts not possible in a solid masonry structure.

Closed as they are the greater part of the time, the solid masonry structure is difficult to heat on days of worship.

The church of NATCO Hollow Building Tile is always dry and therefore quickly heated. The many voids in each unit of the wall provide a blanket of dry air which makes it moisture proof.

NATCO Enclosure Wall Tile

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For Economy and Endurance

Walls of NATCO Hollow Tile afford perfect insulation and a substantial saving in the cost of erection. The large units lay up more quickly and require less mortar than other types of masonry construction.

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This Bucket has four part closing purchase

WILLIAMS GRAB BUCKETS

All sizes and types from 1/10 to 17 tons capacity. Made in Canada by Mead-Morrison—a guarantee of exceptional performance under the hardest conditions

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Car pullers
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Track spikes
Track tools
Wheelbarrows
Winches, ship
Wire cloth
Wire nails
Wire rope and blocks
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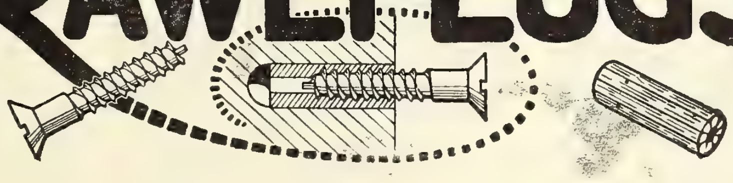
FIX IT WITH

RAWLPLUGS



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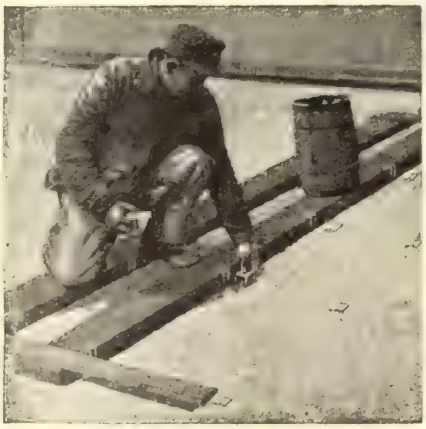
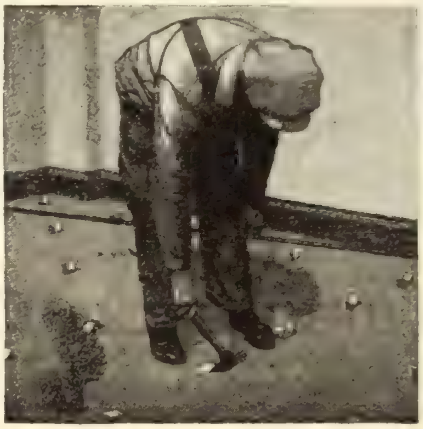
THE BULL-DOG

Modern Money Saving Simple Device

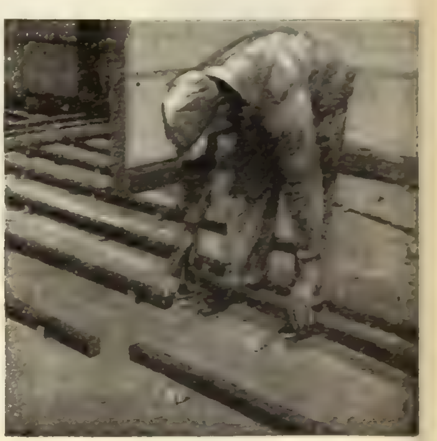
BULL DOG FLOOR CLIPS make it possible to secure the many important advantages of wood floors in reinforced concrete buildings at an economical cost, at a vital saving in time, and with a reduction of 18,000 lbs. dead load per 1,000 square feet. Better still, they assure a floor of lasting satisfaction. Concrete floor slabs are poured as in all concrete work, with screeds placed every 8 or 10 feet so that as the concrete is poured it can be leveled off with a straight-edge. With **Bull Dog Floor Clips,** no expensive fill, no cutting down high spots, and no delays, will be necessary. The simplicity of the six steps in installation is best demonstrated by the series of detail photographs below.



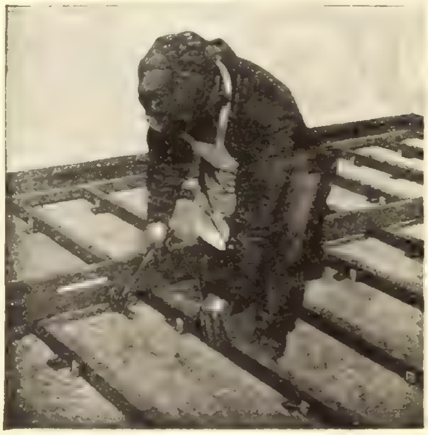
PLACING CLIPS.—Within about 30 minutes after the concrete floor slab has been poured and leveled, the plank-guide is placed on the slab, and while the concrete is still green and soft, the clips are pushed into place, so that they embed with the flat top flush in the concrete, accurately spaced and in alignment. After the guide is made as described, no further measuring is necessary. The concrete worker is then entirely finished with his part of the job.



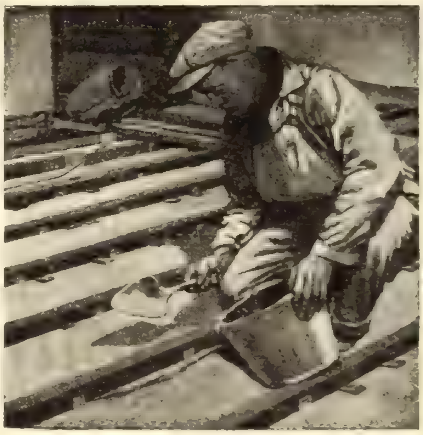
RAISING TABS.—After the concrete slab has hardened it can be used freely for walking, wheeling, or storage, as the flat tops of the clips offer no obstruction. When the job is ready for the wood floors to be laid, a workman goes along with a chisel, or a claw hammer, inserts the edge under the tabs and with a flip of the hand raises them perpendicularly. The solid one-piece clip of No. 20 gauge metal assures rigidity and ample strength.



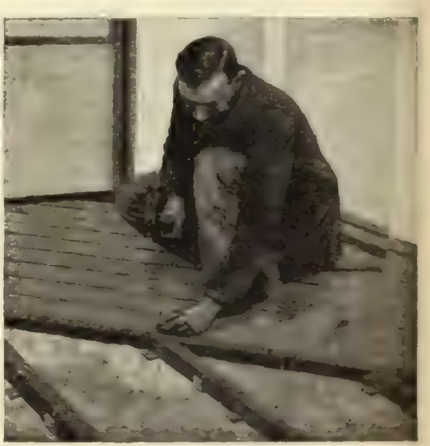
PLACING STRIPS.—Nailing strips measuring 1 13/16"x1⅝", the standard dressing of regular 2"x2" strips, are then placed along the rows of clips where they are held snugly between the raised tabs. Perfect alignment and spacing, 16" on centers in both directions, has been secured by the use of the plank-guides. The simplicity of placing strips with Bull Dog Floor Clips saves about 50% over the old fill-method and assures greater accuracy.



LEVELING-UP.—The level slab obtained by placing screeds before pouring, and the embedding of the clips so their tops are flush with the slab surface, assure an almost faultless base. Some leveling up across the nailing strips will be necessary, after which the strips are solidly nailed through the nail holes punched in each tab. Joints come within the clips. The firm anchorage to the slab obtained prevents buckling or doming, and eliminates squeaking when the floor is walked upon.



SLUSHING-IN.—This, and the preceding step of leveling up, are in reality one operation. After the strips are leveled and nailed there may be a few low spots under the strips. Drive a wedge under the strip at the side of floor clip and then slush full with thin cement mortar to assure an absolutely firm and solid bearing. There will be no high spots to cut down. Having the workmen walk on the planks of the guide has also eliminated foot prints and many other irregularities.



LAYING WOOD FLOOR.—After the sleepers have been securely fastened as just described, the wood finish floor, or the rough flooring if specified, is laid in the usual manner. No fill is required to hold the strips. Carpenters place the strips and lay the finish floor at the same time. There is no delay when time is precious waiting for a cement fill to dry out. The dead air space assists in sound deadening and prevents deterioration by dry rot of the sleepers and finished floor.

THE WESTERN STEEL PRODUCTS LTD.

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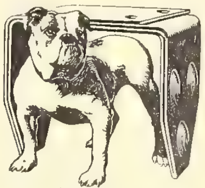
For Laying Wood Floors Over Concrete



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ON U. S. MARKET ONE YEAR—
OVER TEN MILLION SOLD

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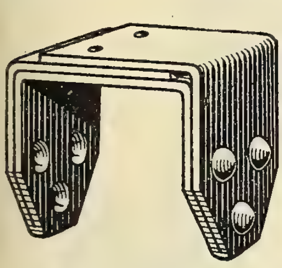
ARCHITECTS & CONTRACTORS who have used **BULL DOG FLOOR CLIPS** say the **BULL DOG METHOD** is the best ever devised to hold a wood floor to concrete.



h 7. 1922
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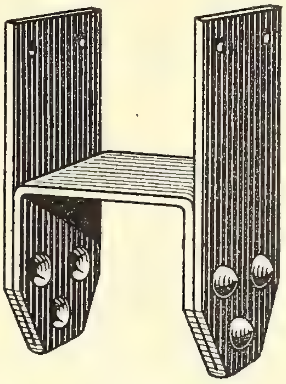
Bull Dog Floor Clip as manufactured and placed in soft concrete, which allows free use of floor.

NO CONCRETE FILL REQUIRED: USE 2 x 2 unbevelled instead of 2 x 3 bevelled sleepers.

ACTUAL MONEY SAVED by eliminating a concrete fill and by using 2 x 2 unbevelled sleepers amounts to over 4c. a square foot of floor area; and over 3c. against a cinder concrete fill.

REDUCE DEAD LOAD:—Approximately 18,000 lbs. per 1,000 square feet by eliminating concrete fill; Great Saving in re-inforcing steel is effected.



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Bull Dog Floor Clip showing top members raised to receive floor strips.

SPEED UP BUILDING:—Unobstructed use of floor slab until you are ready to lay wood floor. Sleepers and finished floor can be laid at one time, thereby preventing costly delays waiting for fill material to dry out.

THE BULL DOG FLOOR CLIP is made of 20 Gauge KEYSTONE GALVANIZED COPPER-STEEL. They hold the sleepers so rigidly to the floor slab that buckling or squeaking of finished floor is impossible; neither will the finished floor dome up from moisture, which is often the case when a concrete fill is used.

ARCHITECTS:—By adopting The Bull Dog Method you eliminate all possibilities of hit or miss construction.

DRY ROT, which usually attacks a poor grade concrete or cinder-concrete fill and is in turn transmitted to the sleepers and finished floor, naturally will not take place; a slight circulation of air under the finished floor keeps it and the sleepers in perfect condition.

CONDUITS AND PIPES can be placed on top of the slab, right under the finished floor; are easy to get at; and are practically free from corrosion, whereas concrete fill corrodes them very quickly.

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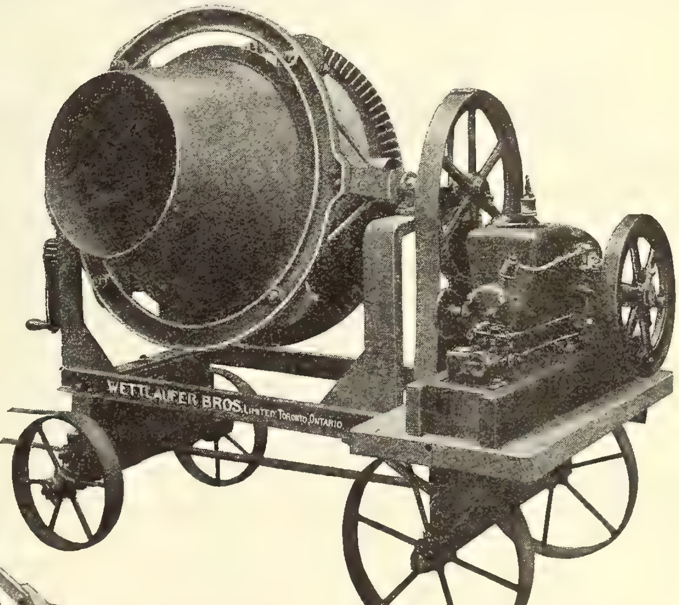

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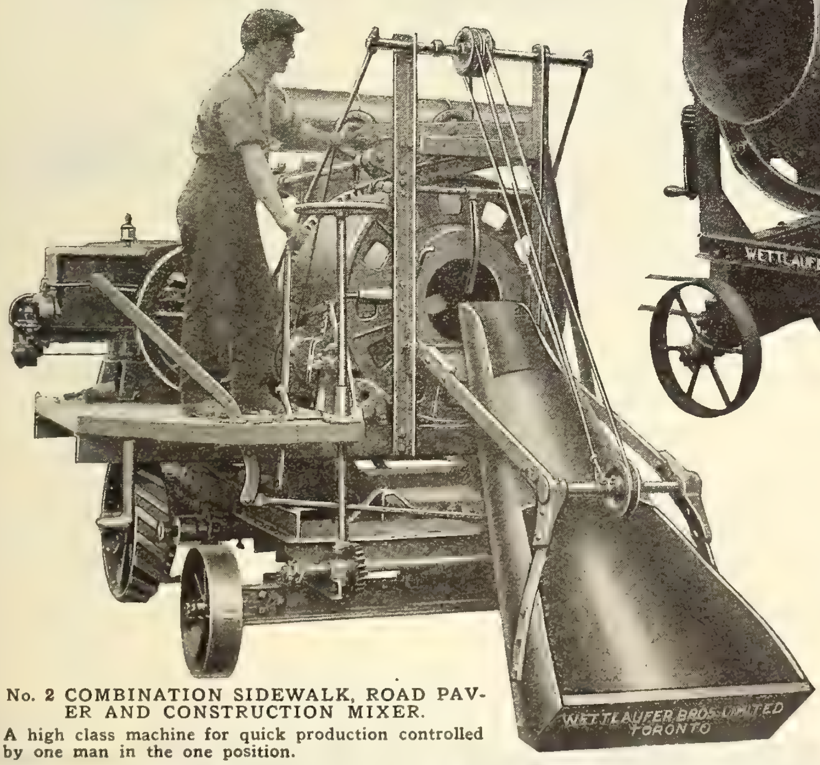

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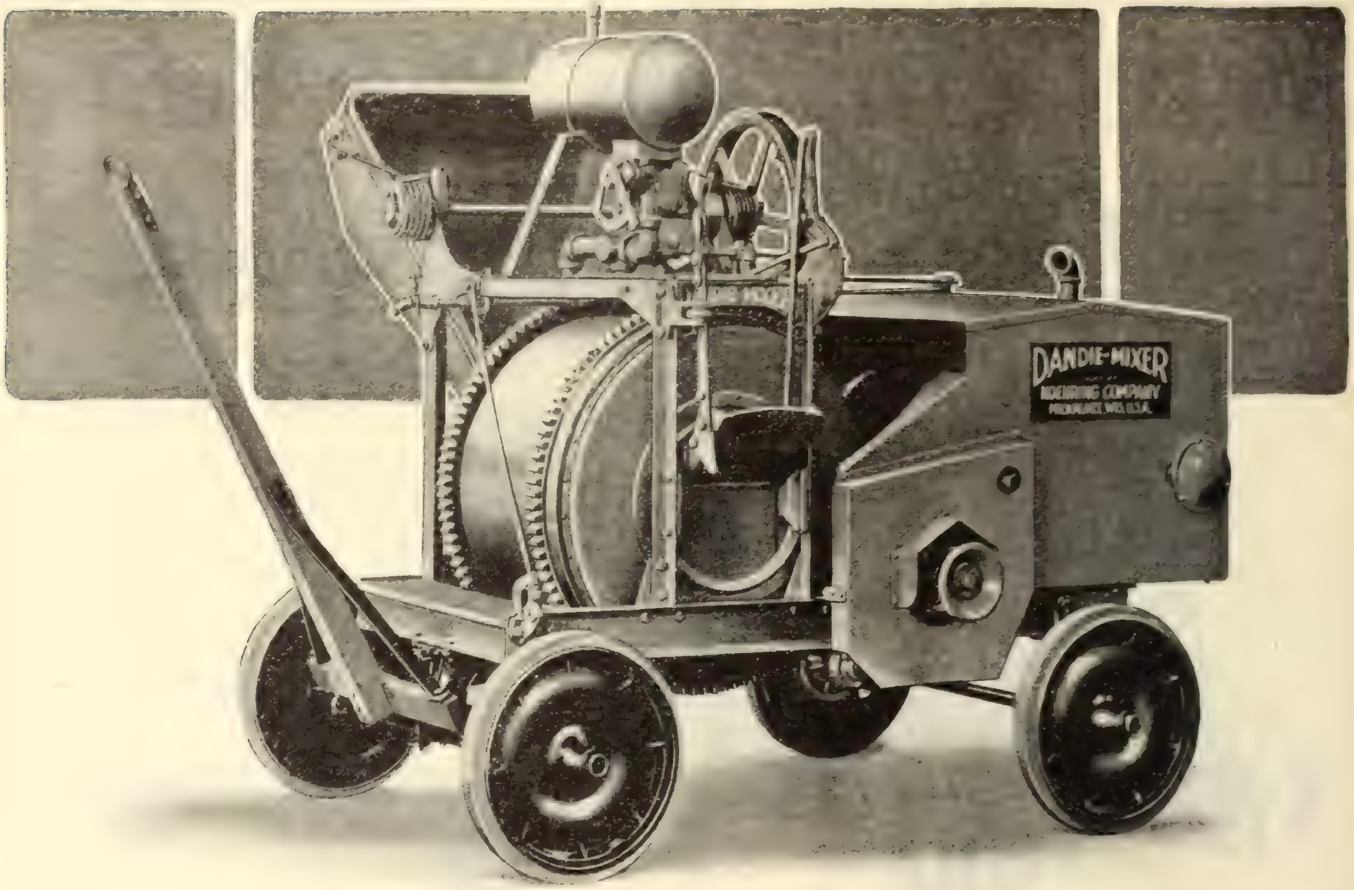

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SAVE time moving from job to job, and use the time for putting concrete in the forms. That's turning overhead into profits.

Hitch the rubber tired Dandie behind your truck and speed from job to job. That means more jobs done per season, and a bigger working field. Where could you find an easier, surer profit?

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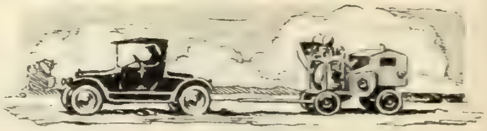

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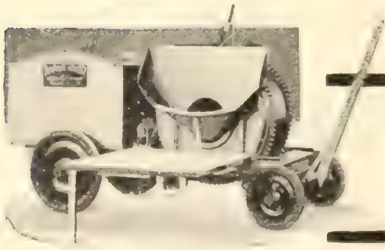

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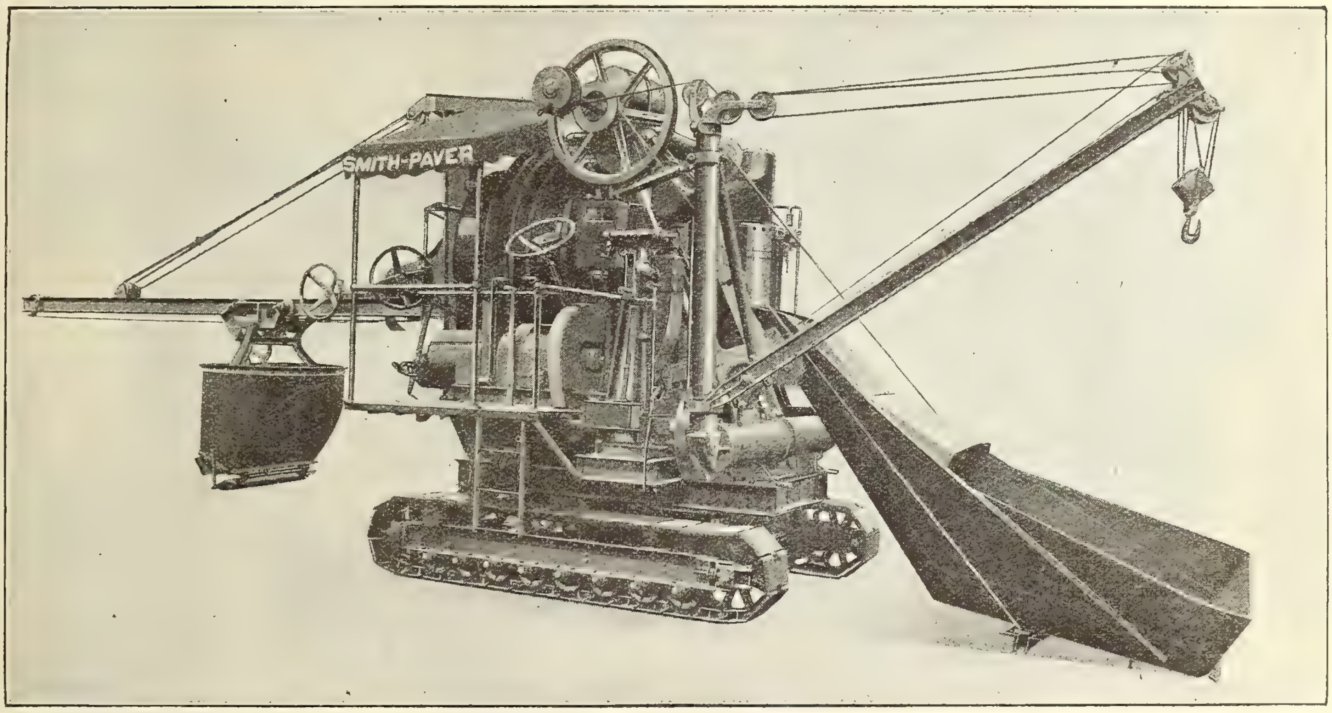

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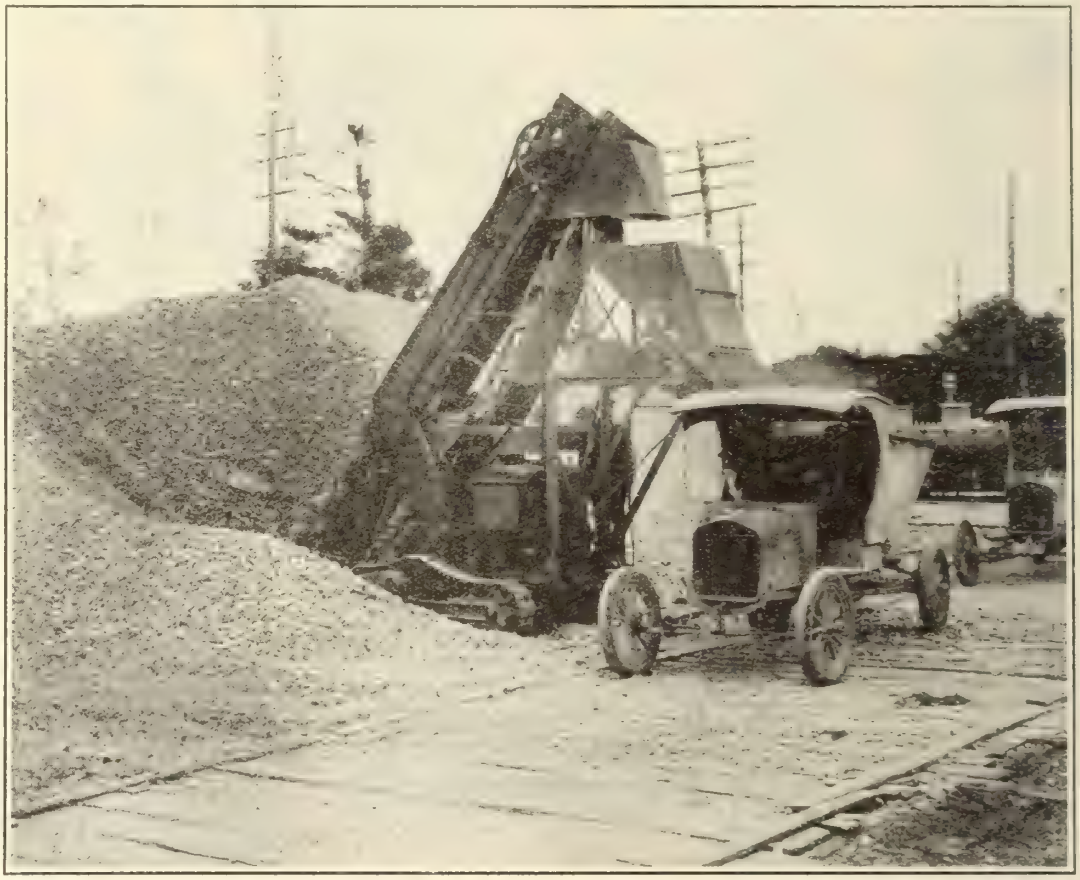

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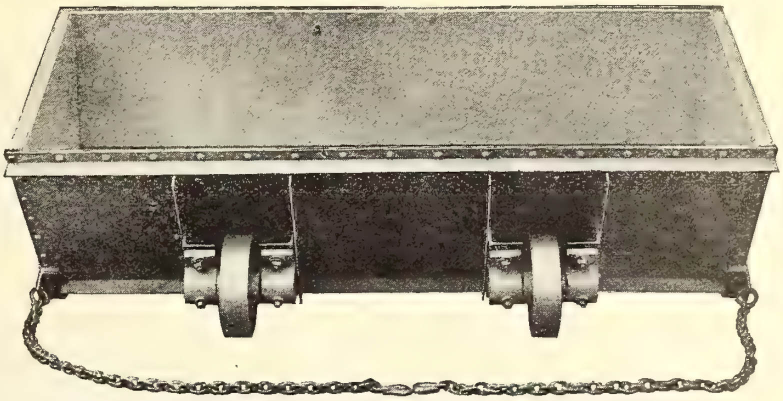

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Pays for itself quickly

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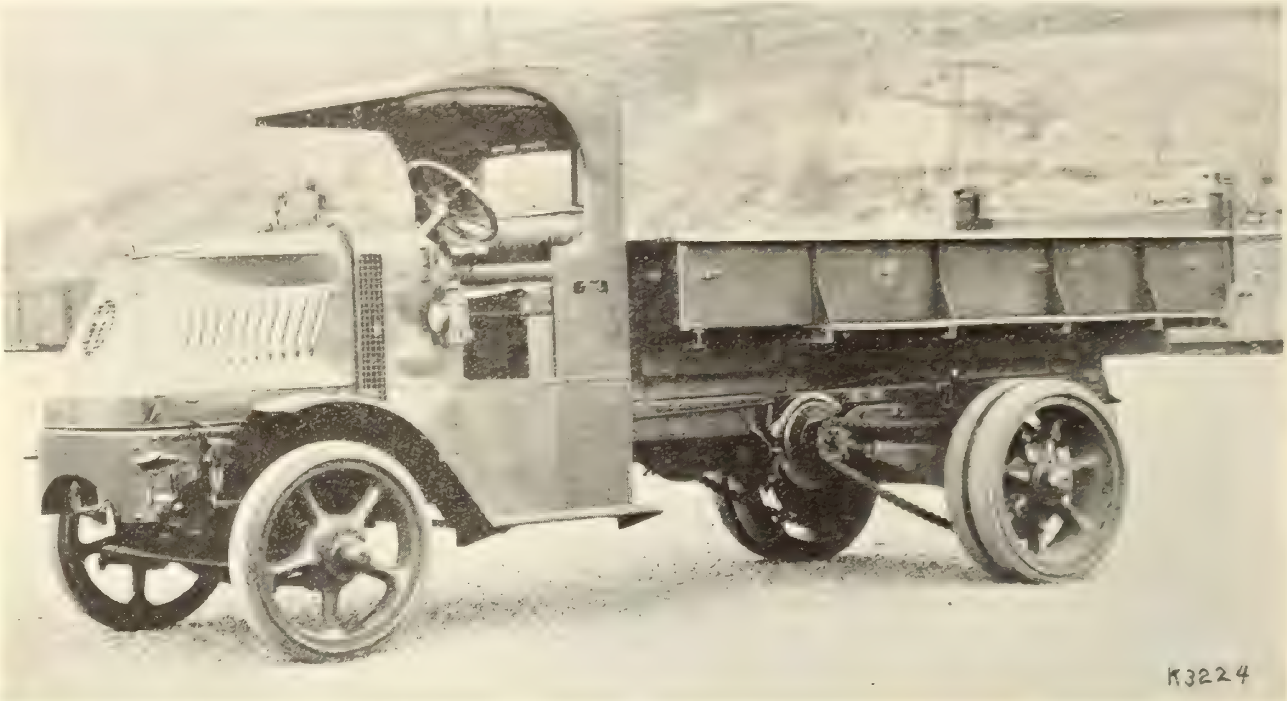

A REMINDER

While it is unnecessary to emphasize to the experienced contractor that the up-keep costs of roads develop in direct proportion to the quality of materials and workmanship put into them, it is not illogical to remind him that exactly the same relation of maintenance quality exists in the case of every piece of mechanical equipment he may possess, and a motor truck is no exception. Every owner of motorized equipment is only on an equal transport footing with his nearest competitor when his equipment is new.

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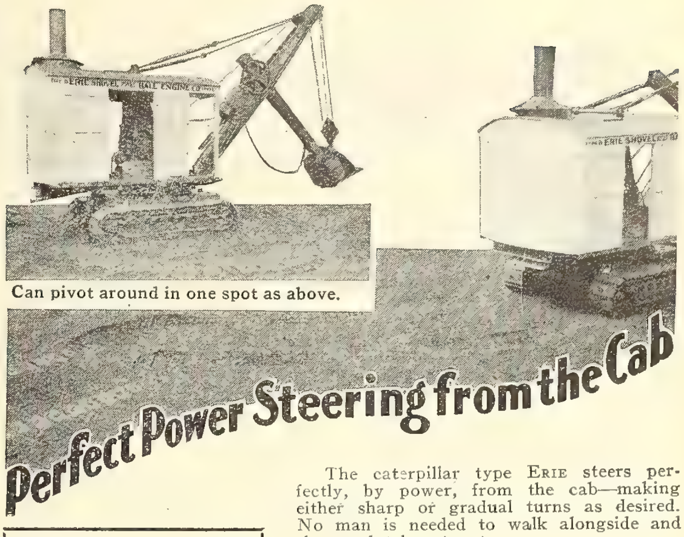

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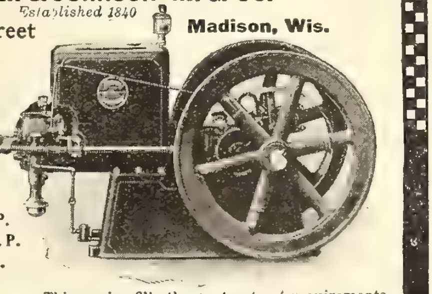

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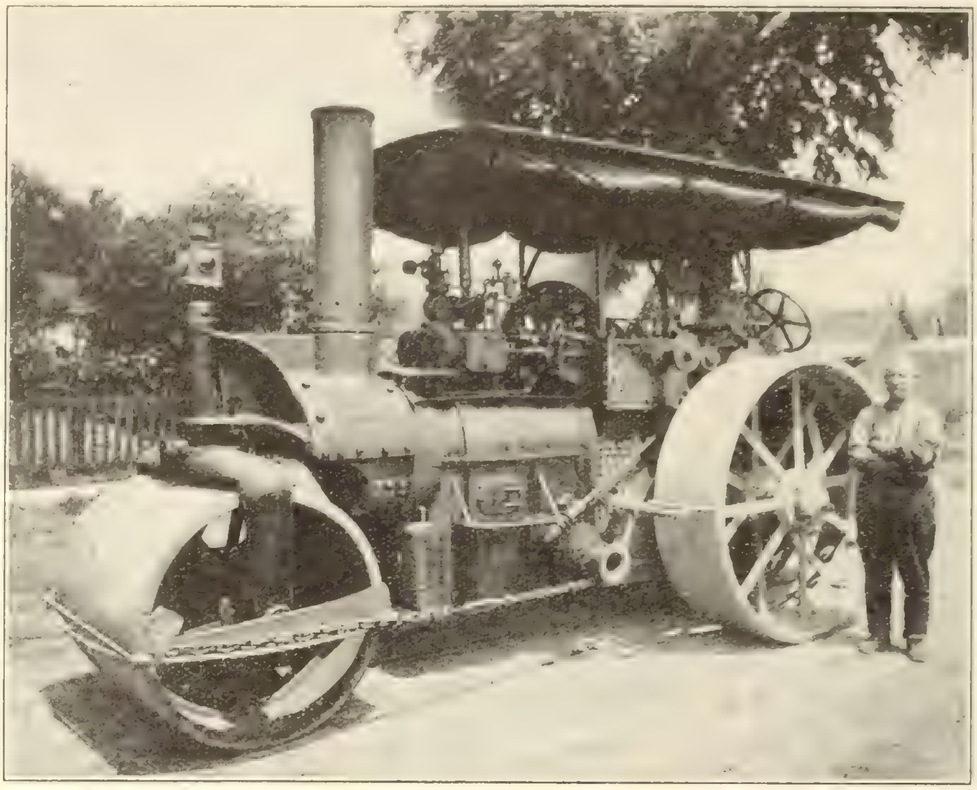

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"Our road roller has been in operation practically continuously since it was bought in 1911 and with only a minimum amount of repairs has given good satisfaction during that period. The approximate expenditure on repairs and renewals to date has been about $400.00. One feature that has been most pleasing to us is the fact that the wheels both front and rear show practically no wear at all notwithstanding the hard work to which it has been subjected."

"In reply to your favor of the 6th inst., in regard to the 10 ton Steam Road Roller purchased from you in 1906. We wish to say that the roller is still going strong and in addition to the work on the Town roads last season it was used on the County roads and in other Municipalities in this vicinity and was in commission working steadily for the greater part of the working season. Owing to some of the castings having become much worn they were replaced last year at a cost, for castings, labor replacing and general repair of $228.29. In other years the cost for repairs has been about $50.00 per year. We expect to have many years service from the roller and there has been no thought of replacing it."

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ESTABLISHED 1886

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Early Awards of Road Contracts

Several road contractors have spoken in an appreciative way of the Ontario government's present policy of calling for tenders and awarding contracts early in the season. They realize the advantages of knowing what they have to do well before the construction season opens and, by thus having time to get their plans matured, they will, in all likelihood, be able to work more effectively and give the government better value for their money. Whatever may have been said against the Ontario highways department a few years ago, regarding the practice, then current, of calling tenders in the late spring or summer rather than in the winter, little criticism can now be directed against the department on that score. Within the last two months or so, dozens of tenders have been called and a great many have been awarded, while others are only awaiting official approval of their release. The contractors concerned are in nearly all cases now actively engaged in preparing to carry out their contracts. Thus, even before the snow is off the ground or weather suitable for construction operations, plans are being matured so that at the first indication of propitious conditions, plant will be moved up, labor will be assembled and work will commence in earnest. No uncertainty, confusion or delay! Nothing to hinder the continuous and uninterrupted progress of the work! Less interference with the traffic that normally uses the road! An earlier completion of the job and, consequently, greater benefit to the road users!

Compare with this the system that was in vogue up till recently. Tenders asked in the summer time; contractors not much interested, as they do not care to wait till June or July to be assured of a job; contracts awarded so late that the pick of the labor is gone and plant is hard to assemble; a tremendous rush to ensure completion of the job before winter; a whole season's use of the road sacrificed; and prices high because conditions are not suited for economical construction. Fortunately, public bodies see that a situation like this costs them money and gives them poor work; consequently they are being converted to the early-letting idea—with immense benefits to themselves and important advantages to the contractor.

Ontario is indeed acting in her best interests to call tenders early. Better value for her expenditures will undoubtedly ensue.

Allay Suspicion Regarding Hydro

The opinion is frequently expressed in connection with the present investigation of Hydro matters in Ontario by the Gregory Commission that there seems to be an unnecessary amount of washing of dirty linen in public and the fear is expressed that the enemies of the Hydro will gain an undue advantage thereby. It is also said that the financial credit of the province may be injured. We do not agree with either of these arguments if the investigation is properly conducted. There is nothing so fatal to any undertaking as suspicion and the sooner everything of a suspicious nature in any enterprise is exposed to the light of day the sooner the confidence of the public is established. If, in the judgment of the Ontario Government, there is need for investigation of Hydro matters, then by all means make it thorough. That we have no doubt, was the original intention of both the government and the investigation commission.

It might almost seem perhaps that the very zeal with which the latter is searching for truth may have led the members of the Gregory Commission to a point where they actually act as if antagonistic to the Hydro. In their enthusiasm for getting at the facts they appear, to some, to have descended from the chair of the presiding judge to assume the function of the prosecuting attorney. If that be actually so, this attitude doubtless is responsible for the expressed fear that the cause of Hydro is being injured and the credit of the province jeopardized.

The electors expect an investigation, and a report that gives all the facts and all the conditions their proper relative value and significance. Preconceived prejudices in either direction or personal likes or dislikes have no rightful place in such a tribunal. The people of the province have all made big personal financial investment and they want a proper financial statement.

How About Next Winter's Coal Supply?

Are We Going to Tackle this Problem With Both Fists or Are We Going to Passively Trust that Things Will Turn out All Right?—Now is the Time to Secure an Assured Supply

The question of Ontario's next winter's coal supply has finally been raised in the House of Commons by the member for North Toronto, Mr. T. L. Church, and the matter referred to the committee on Mines and Minerals. It remains to be seen whether this committee will bring in a constructive report and, then, whether our government is prepared to act.

In making a study of the whole coal situation there are a few axioms upon which the citizens of the Provinces of Manitoba, Ontario and Quebec, but mort particularly Ontario, must necessarily base their course of action. These, briefly set forth are:

1. Fuel is an essential to our very existence.
2. We are dependent for this essential, at the moment, on a foreign country.
3. It is quite conceivable that the United States, for one reason or another, may cease export to Canada without notice.
4. We have sufficient fuel resources within our own borders to be independent, but—
5. In case of sudden unfriendly action by the United States our own supplies are not quickly available. This may easily result in serious hardships, both physical and financial, compared with which the inconvenience of the past winter would be negligible.

The Imminence of Tragedy

It is very important that we should all realize the significance of the statement in number 5. We are foolish if we do not face the fact that thousands of people in Ontario's towns and cities were, during the past winter, faced with conditions that must have proved fatal if they had not been remedied promptly. If an embargo had been imposed or if, due to any cause, transportation communications had been cut for any considerable length of time our people must have died by the hundreds. With the warm spring sun shining down upon us we are apt to forget the near tragedies of the twenty-below-zero days of January.

The immediate solution of our fuel problem is thus vitally important. How can we go about it?

The first thing that naturally suggests itself is to ask whether it is possible to secure any guarantee of the continuance of the anthracite coal supply from the United States. Most large industrial purchases are made contingent upon delivery at a certain date and with a stiff penalty clause attached in case of non-fulfilment of agreement. Could coal be purchased from the mine owners in this way and would such an agreement be a sufficient safeguard for us? It is doubtful. Public opinion may easily render it impossible for the mine owners to ship coal and the collection of a penalty would be difficult. Even if collected it would be useless to relieve distress. Another natural query is whether the United States Government could and would give guarantee of delivery. This might be possible if we had something equally essential to them which we could offer in exchange. Such guarantee would give us a greater sense of security but even governments have their limitations in carrying out contracts.

The only real guarantee that we shall have enough anthracite coal for the next winter is **delivery in advance**—and sufficiently in advance that we have time to provide our own substitutes.

It would seem as if this matter of delivery in advance is the kernel of the whole matter. How can it be accomplished? Whose duty is it to see to it?

There are many demands being made upon our government to **do something** about the coal supply. Evidently in the minds of the average citizen there is the feeling that the government should be able to supply coal for everybody, as required, at a price comparable with what we should have to pay for U. S. coal if we could get it. But isn't this asking more of the government than is humanly possible—even if we eliminate the question of price?

The Dangers of Going into the Coal Business

Aside from what has been already suggested above, viz., that the Canadian government should try to extract some guarantee from the U. S. government for delivering a stated quantity of coal per annum, there is little left for our government to do except to go into the coal business itself—indirectly at least. Suppose it did so. Suppose it began shipments of coal from Alberta and Nova Scotia in April. Under present freight rates the cost would be somewhere in the neighborhood of $20.00 a ton—not less. Would the people of Ontario fill up their cellars at this price? Certainly not. The average householder would say "I'll wait and see if I can't get anthracite." The government would then have the alternative of storing, at some convenient point, a huge supply. How would this work out? To begin with there would be a certain deterioration. Then there would be the added cost of storing and extra handling. Finally there would be the possibility—indeed probability—that the United States operators would exert extra effort to supply Ontario and the Government would find itself left with a huge investment on which they might not realize for years. Considering the regularity with which election time comes around it is doubtful if any party government will take a chance of this kind. There is another point to be reckoned with too in this connection. The United States operators would have full knowledge of the higher cost of the stored Canadian coal and could be depended upon to make their own prices accordingly having it impressed upon them that we had no other alternative.

An Assured Supply is What is Wanted

It would thus appear that there can be no middle course. Either we must make **certain** of our **next** winter's coal supply or we must leave the matter exactly at it stands today with the possibilities of disaster as already outlined. Surely we all vote to make the supply **a certainty.** How can we do it?

1. Will the U.S. Government guarantee to supply all or any part of our needs? This amount having been fixed, cannot further importation be prohibited.

2. The balance must now be brought from East and West, not as a political, but as a united national policy on which we all agree to stand or fall together and,—

3. The cost to the consumer should be made not greater than the cost of the imported product.

In connection with 3 it would seem as if there is reasonable hope of accomplishment without any drain on the Dominion tax payer. Under the scheme outlined the exact requirements of Canadian coal to within a few thousand tons would be determined several months in advance. It would thus be possible to utilize our transcontinental railways and our mine labor at a time when they would otherwise be practically idle. Coal could be carried in train loads during, say April, May and June from Alberta to Ontario and during the grain shipping months, on the return trips, from Nova Scotia or by some such economical arrangement, and mine labor which is generally at a discount during the early spring months would thus be enabled to work the year round and still be better off at a lower wage than they are today working eight or nine months at abnormally high wages.

An Easing of Labor Costs

And in this latter connection it is worth noting that the labor charges in coal production are very high. In the Alberta field, for example, where the wages range from seven to twelve dollars a day the cost of coal at the mine mouth is about 70% wages. In this particular area the price at the mine mouth is $7.00 and the cost of labor is thus $4.90. From this same mine to Toronto the regular freight rate is about $13.00. Allowing $2.00 for delivery, this would bring the cost to a Toronto consumer as $22,-00. If the labor cost could be cut a dollar and the freight rate cut in two this would reduce the final cost to $14.50. This is for a good quality of semi-anthracite furnace coal that is said to give entire satisfaction.

In the discussion of the whole matter we must keep in mind that it is not so much a momentary emergency we are called upon to meet as a permanent inevitably more difficult situation from which there is no human hope of escape. The United States supply of anthracite is limited and with the most friendly relations in the world, they are certain to conserve it for themselves. It may be six months or six years but it can't be a long period and it may be startlingly short. It is devoutly to be hoped that the Committee to which the making of a report has been entrusted will do its work promptly and thoroughly and that parliament will act as a unit in pursuing the course that promises best to meet the situation with which we are confronted.

Creosoted Wood Blocks Make Ideal Stable Floors

Wooden flooring for stables has much to recommend it, but unfortunately the conditions connected with its construction and use are specially favorable to decay. Frequent renewals of such flooring often cause owners to adopt some more durable and less comfortable material. The Forest Products Laboratories of Canada (Dominion Forestry Branch), Montreal, point out that the remedy lies, not in discarding wood and substituting concrete or stone pavement, but in using wood which has been rendered proof against decay. For this purpose creosoted wood blocks are suggested as possessing the greatest number of advantages as a stable floor. Creosoted wood-block flooring is warm and easy under foot, very resistant to wear, easy to clean and has sanitary and vermin-repellant properties combined with a high resistance to decay. Owing to the establishment of several wood-creosoting plants in Canada, such blocks may be obtained at a reasonable price, and the cost of maintenance is very low.

Tenders for Montreal Court House

For the construction of the Montreal Court House, the contract for which was recently awarded as stated in the Contract Record, the following tenders were received:

For Construction work with stone walls:

Atlas Construction Co. Ltd.	$2,050,000
Alphonse Gratton	2,122,312
John Quinlan & Co.	2,160,316
E. G. M. Cape & Co.	2,207,000
Quinlan, Robertson & Janin	2,330,000
P. Lyall & Sons Construction Co.	2,400,126
J. B. Gratton Ltee	2,520,000

With granite walls:

Alphonse Gratton	2.245,273
Atlas Construction Co. Ltd.	2,250,000
John Quinlan & Co.	2,290,033
E. M. G. Cape & Co.	2,353,000
J. B. Gratton, Ltee	2,411,250
Quinlan, Robertson & Janin	2,460,000

With stone walls and facade in granite:

Atlas Construction Co. Ltd.	1,943,560
Alphonse Gratton	1,995,600
John Quinlan & Co.	1,997,487
E. G. M. Cape & Co.	2,057,000
J. B. Gratton, Ltee	2,191,085
Quinlan, Robertson & Janin	2,220,000
P. Lyall & Sons Construction Co.	2,356,061

With facade in Queenstown stones:

Atlas Construction Co. Ltd.	1,954,811
Alphonse Gratton	1,987,360
John Quinlan & Co.	2,010,784
E. G. M. Cape & Co.	2,030,000
J. B. Gratton, Ltee	2,056,530
Quinlan, Robertson & Janin	2,210,000
P. Lyall & Sons Construction Co.	2,367,561

Benedict Granite or Indiana Limestones:

John Quinlan & Co.	1,960,784
E. G. M. Cape & Co.	1,987,000
Alphonse Gratton	2,044,340
Atlas Construction Co.	2,050,000

Benedict granite.
Indiana Limestone.

The contract for this part of the work was given to the Atlas Construction Company and the Alphonse Gratton firm at a cost of $1,943,560.

For plumbing works the tenders received were:

James Ballantyne	$ 216,987
Conroy Bros.	235,000
The Garth Company	246,000
O. Caron	247,155
Jos. A. Francoeur & Co.	281,400

Contract awarded to James Ballantyne.

Electrical installation tenders:

Canadian Comstock Co.	$ 21,900
Collyer & Brock, Ltd.	27,361
Rochon & Desrosiers	38,500
N. Simoneau	46,700

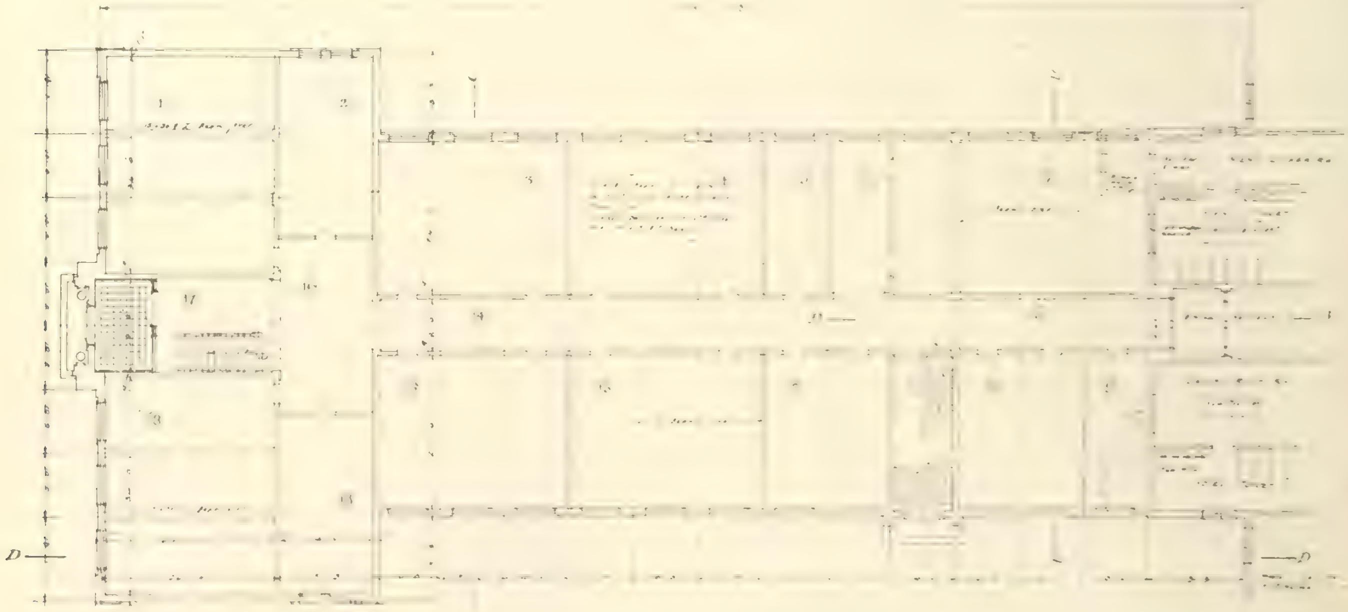
Contract awarded to the Canadian Comstock Co.

Emergency Building Extension, University Campus, Winnipeg

This article is descriptive of the new centre wing which is an extension of the present science buildings on the University Campus, Winnipeg. The work was carried out on day work by the provincial government under the direct superintendence of the Department of Public Works.

The building consists of a two-storey wing without basement. The foundation walls are taken down below frost line, and have concrete footings and foundation walls of rubble stone to grade level. Above grade the outside and corridor walls are of brick. Steel beams set 10 feet on centres carry the second storey floor joists over a 24 foot span. The outer walls are finished on the outside with roughcast, and on the inside with strapping, wire lath, and plaster. The flat roofs are covered with tar and gravel roofing, and the sloping portions of the roof have red asbestos shingles.

Inside the building the accommodation consists of class rooms, men's common room, lecture rooms, and locker rooms. All the rooms open off a main corridor running the full length of the building, connecting at the west end with the present science annex. Two staircases are provided, one at the east end immediately adjoining the main entrance, and the other connecting the two floors at the west end. The stairs are of wood, treads being covered with linoleum with metal nosings. All the floors are of maple and the men's room, locker rooms and corridors are covered with linoleum. All trim inside the building is of fir, stained to a dark color with dull finish. The windows are wood sash, with storm

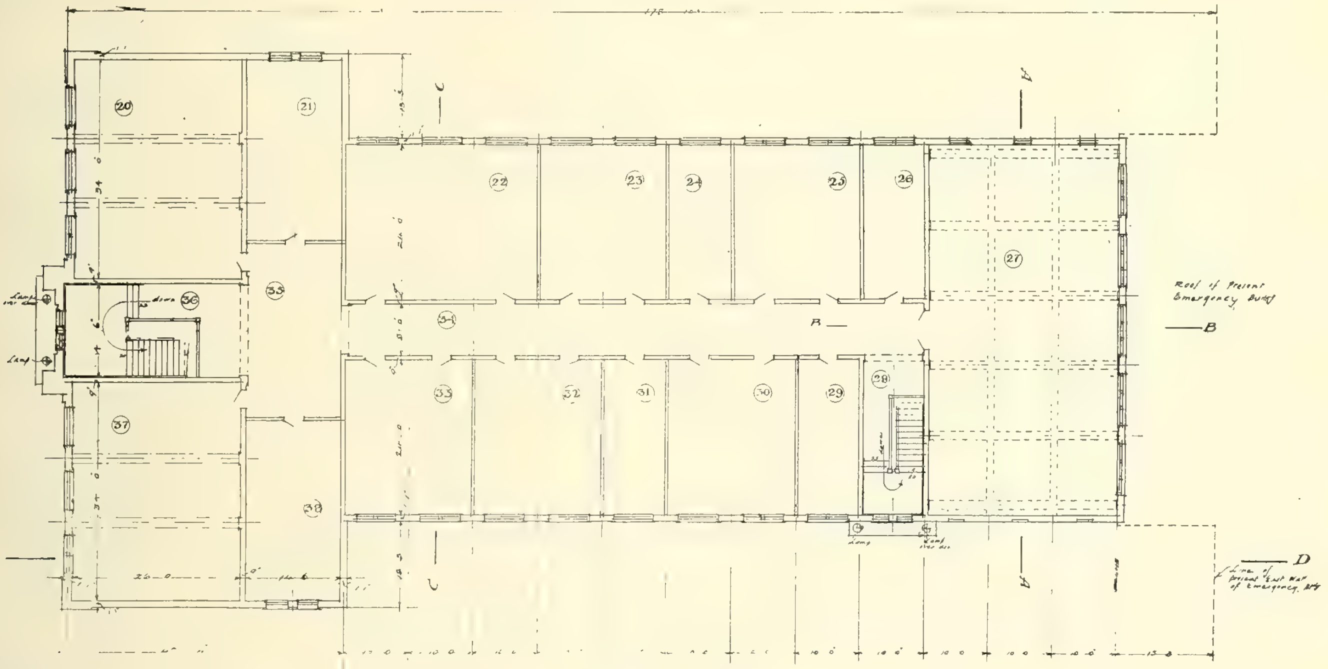


Second floor plan

sash hung inside. All the rooms and corridors are well lighted, and a pleasing effect has been obtained by tinting the walls in two shades of buff. The vestibules have tile floors and tile dados.

The accommodation includes a lecture hall on the second floor, with seating capacity for 150 students. This room is 56 feet by 30 feet, and has a large top light in addition to windows along one of the side walls. There is a small office adjoining. Class rooms varying in size, range along either side of the main corridors on both floors, the largest of these class rooms being 34 feet by 26 feet and occupying the front portions of the building. Some of the class rooms have offices adjoining. Two separate locker rooms for male and female students are provided on each floor fitted with up-to-date lockers. These locker rooms are placed convenient to the main entrance and staircase. A large men's common room is provided on the ground floor, this room is entered from the men's locker room in the science annex. Additional lockers have been installed here, and a new locker room provided. There is also a staff cloak room and a janitors' room with wash-up sink.

Ample radiation has been provided for all rooms and corridors by means of radiators throughout the building, and a system of temperature control is installed.



Plan of the first floor

The electric wiring is in conduit throughout. A tunnel or pipe duct of reinforced concrete connects the science buildings with the power house adjoining the new law courts. The pipes for supplying heat to the new building, cables for electric lighting, and all other services are contained in this tunnel. Inside and outside, the structure follows very simple and severe architectural lines, no ornamentation of any kind was considered. Plainness of design inside the building was considered essential to good sanitary conditions and to the uses to which the building will be put. There are 20,884 Supl. feet of floor area, and about 501,216 cubic feet of space in the building.

John Manuel, Lic. R.I.B.A. was the architect for this building, as also for the new science laboratories built in 1919-20. The cost of the completed building was in the neighborhood of $80,000 exclusive of the furnishings.

Large Order for Turbines

An order of record size has just been received by the Canadian Allis-Chalmers, Limited, Toronto, for the supply of hydraulic equipment to the Quebec Development Corporation. This corporation has already commenced construction work on its power plant on the Saguenay River, close to Lake St. John, which calls for an ultimate installation of twelve turbines of 37,500 h.p. capacity each. The order received by Canadian Allis-Chalmers is for the first eight of these units. The turbines will be of the vertical type, 112½ r.p.m., 37,500 h.p. at 9/10 gate opening.

The other four units are not being installed immediately but the same company has been awarded the contract for the extra casings and speed rings which will be installed at the same time as the first eight units, in anticipation of the complete installation being required in the near future.

Larger Premises in Toronto for Mussens Ltd.

The Toronto office of Mussens Limited, has been moved from 546 Confederation Life Building to more commodious quarters at 319-20 in the same building, fronting on Richmond and Yonge Streets. Increased warehouse space has also been arranged for and the company hopes in this way to give still better service to contractors and municipalities throughout the province.

New City Engineer for Hamilton, Ont.

Mr. W. F. McFaul has been appointed city engineer of Hamilton, to succeed Mr. E. R. Gray, who resigned recently. M. McFaul was formerly deputy city engineer at Hamilton, under Mr. Gray.

Present-Day Tendencies in Bridge Design

Planning Largely in the Hands of Bridge Erectors—Maintenance Engineer Has Done Little Toward Increasing the Expectation of Life—Impact is a Subject That Requires Further Study

By T. C. HOOD, B.Sc., in "The Engineer"

Modern ideas as to what constitutes good design in a steel structure are the results of a progressive development in the minds of designers during the past century. The earliest designers were men in whom the faculty which we may call engineering instinct was highly developed, but who, as a rule, had no knowledge of the mathematical principles which determined the stresses in the various parts of the structures they built. The fact that they were able to build bridges of considerable magnitude which gave satisfactory service for many years must always be a source of admiration and wonder to succeeding generations. The discovery of the laws governing the distribution of stress in beams and articulated structures followed the work of these engineers, and gradually, as this knowledge was developed and spread abroad, gave lesser men the power to design.

With the introduction of cheap rolled iron sections the demand for designs for structures of all kinds grew rapidly. This stimulated the study of design, produced new designers and rapidly developed the art of design. In the last thirty years particularly strong influences in the development of design have been the publication of many excellent text-books on stress distribution and the employment of designers by manufacturing firms. Ambitious young draughtsmen, trained in the works, knowing all the details and processes of manufacture and the possibilities of tools and workmen, found evening classes at which they could acquire education in technical subjects, and well-written text-books, which gave them the theoretical knowledge they required. In their daily work they had opportunities of studying designs by many professional engineers, and as they took out quantities and prepared estimates for the work, comparison between one design and another was inevitable. A few years at this work converted a keen draughtsman into a capable designer, and an asset of the utmost value to his firm.

Designs by the Erectors

The manufacturer found himself in a position to offer suggestions to an engineer for the modification of his design, and, as confidence in his staff grew, was able to offer complete alternative designs with advantage in cost to the purchaser. And so has grown the modern practice of tendering for manufacture with design. Consulting engineers have acquiesced in this arrangement, because it simplified their own staff problems and gave them the advantage of expert assistance, while leaving the final approval of design in their own hands.

Manufacturers improved their designing staffs and began to be regarded as experts in design as well as in fabrication, and were often approached by purchasers without the intermediary consulting engineer. That the quality of their designs should have improved steadily until it reached its present very high level of excellence, instead of being degraded by subordination to the natural desire for high profits, is very much to the credit of manufacturers in general. The tendency of design through this period has been towards simplicity and, by the correct placing of adequate material, lightness. The combination has resulted in reduction in cost, and improved efficiency.

It is curious that the modern development of design should apparently have been effected by the consulting engineer, the professor and the manufacturer. The person most directly and personally interested—that is to say, the maintenance engineer—does not appear to have had any say in the matter. This omission may be more apparent than real, but it is certainly the case that, as far as railway bridges are concerned, improvements in design with the object of increasing their expectation of life are far less evident than improvements for efficiency and low first cost.

The Calculation of Stresses

Modern English practice in the computation of bridge stresses is so nearly standardized that the variations in detail adopted in different offices have hardly any effect on the sizes of the members of the structure. The publication by the British Engineering Standards Association of a standard specification governing stresses and methods of calculations, as well as manufacture, will no doubt reduce the present variations in practice to a minimum.

Among many bridge engineers, however, there is a growing doubt as to the accuracy of the modern method of stress calculation. The use of the Fereday-Palmer stress recorder, an instrument whose accuracy is unquestioned, shows in many cases that the actual stress in a bridge member is quite different from the calculated stress. The calculation of stress in old bridges frequently indicates stresses whose magnitude is denied by the physical condition and behaviour of the bridge.

In plate girders there is not much question as to the correctness of the moment of inertia method of calculating flange stress, but there is considerable doubt about the stresses in the web and web-to-flange rivets. Very high bearing stresses between the web plate and rivets connecting it to the flange angles, as calculated by the most accurate methods, may possibly exist without showing any sign of their existence, because the flow of the overstressed metal is resisted by the comparatively lightly stressed metal held firmly round it by the strong grip of the rivet heads. It is difficult to devise any experimental method of discovering the truth in this matter.

In trussed girders there is room for more comprehensive doubt. The ordinary calculations for primary stress in a truss depend for their accuracy upon a number of assumptions which are entirely unjustified in fact. Eccentric connections, unsymmetrical members and rivet groups have practically no place in modern bridge design, so that secondary stresses produced by such irregularities may be left out of our consideration. But the secondary stresses produced by the distortion of a truss under load must always be of serious magnitude. The text-books give details of the long and laborious calculations necessary to arrive at an estimate of the magnitude of these stresses and also of the method of computing the small deduction to be made from the primary stresses before the secondary stresses are added to them to give a correct grand total. It would appear that in trusses of ordinary proportions secondary stress due to truss distortion amounts to from 10 per cent. to 120 per cent. of the primary stress. It will naturally be greater in a shallow truss that in a deeper one of the same span, and for any given span and deflection it will be greater in the truss which has the broader and deeper members and the larger gusset plates at their connections.

Hard to Reconcile Text-Book Reasoning With Practical Examples

While it is difficult to discover any flaw in the reasoning of the text-books, it is equally difficult for the bridge engineer who has had much experience with old bridges to reconcile the two. There must be many bridges carrying their load with every evidence of safety, in whose members and joints the orthodox calculations will discover stresses exceeding the ultimate strength of the material.

The common basis of all specifications regulating design may fairly be described as a conviction that in no part of the structure must any probable combination of loads produce a stress exceeding the elastic limit of the material. It will seldom be questioned that a structure which is stressed in any part beyond the elastic limit of the material must, after a certain number of repetitions, disclose the fact by its altered shape. If the converse of this be true, that a structure which retains its original shape has not frequently been stressed in any part beyond the elastic limit of its material, then the orthodox method of calculation must be defective.

For the designer of new bridges this is not of great importance, because his experience assures him that his methods produce bridges which give satisfactory service at reasonable cost. But the railway bridge engineer is in a very different position. He is expected to decide as to whether a bridge may safely be allowed to carry heavier engines than those at present in use, or whether it is safe to allow it to continue to carry its accustomed loads, whether a speed restriction will enable it to carry on safely, or a reduction of load is necessary. These are decisions which frequently involve very large sums of money, saved to the administration by the introduction of heavier engines and loads, or lost in increased cost of transportation by reduction of loads and speeds. The engineer will give his decision after careful inspection of the bridge and precise calculation of existing and altered stresses. If the result of this inspection and calculation confirm one another, the outcome is clearly indicated. But in many cases inspection and calculation reveal entirely different conditions and the bridge engineer is compelled to revert to his engineering instinct, or, more easily, play for safety at the expense of the administration.

The desirability, in the interest of bridge owners as well as in those of the engineering profession, of discovering the meaning of these discrepancies between theory and practice is quite obvious. If bridge owners, Government departments, and professional societies can be induced to view the matter as one worth spending money on, there is no doubt that mathematicians and bridge engineers can be found in many quarters to carry out the necessary investigations.

The tests of bridges, with stress recorders and deflectometers, which have recently been made on a large scale in India under the authority of the Indian Railway Board, and in England by the Ministry of Transport and British Engineering Standards Association, although primarily intended to decide the vexed question of impact, may possibly help to throw light in other directions. If all efforts to discover the truth about bridge stresses could be co-ordinated under a single authority a great deal of time, labour and expense could be saved, and decisions could be accepted with the greatest possible confidence.

Impact Stresses

Regarding impact as the difference between the effect of a static load applied so gently as to produce no vibration in any part of the structure, and the effect of the same load when rolled at speed over the bridge, it is clear that we divide all the stresses into two classes, viz.:—

(a) Those due to loads, assuming them to be static.

(b) Those due to impact.

The algebraic sum of the two classes of stress should give, for any member, the actual stress as measured by a stress recorder. In the past, divergence between calculated and measured stress has been attributed to defects in the measuring instrument and error in the method of calculating impact. But the author is not aware that any serious attempt has been made to confirm by experiment the recognized methods of calculating static stress, although that would appear to be the natural first step in the process of investigation.

The difficulties in the way of determining static stress by measurement are considerable. Owing to the existence of secondary stress due to stress distortion, the static stress in a member may not be uniform in any cross or longitudinal section. Extensometers and stress recorders give the average stress over a length of from 20 in. upwards, and are therefore quite useless for the purpose of measuring the actual stress at a particuliar point. But it should not be impossible to devise an instrument capable of measuring a difference in stress of one-tenth ton per square inch on a length of 1 in. It need not be a recording instrument for static stress, and instrument vibrations would be allowed to die out before taking a reading. Such an instrument would enable us to make a complete survey of the increase in stress in different parts of a member simultaneously, for a definite added static load. This line of investigation should enable us to decide whether the presence of heavy deformation stresses involves a great reduction in primary stresses, or whether the accepted theory is correct. There are a great many other questions concerning the magnitude of local stresses due to a variety of causes which the instrument might be used to elucidate for the benefit of the railway bridge engineer.

The subject of impact has been discussed widely for a number of years, and many experiments have been made with the object of discovering by how much the static stress, as calculated, should be increased to cover all the effects of the moving load. The only definite conclusion arrived at up to now and generally accepted is that very many more experiments must be made before the investigation can be called complete and satisfactory deductions drawn.

A Vibrational Stress

A comparison between the records, whether of stress or deflection, made during the passage of a train over a span at speed and dead slow, will at once lead to the conclusion that impact stress is a vibrational stress. The record at dead slow is a smooth curve indicating gradual variation in stress or deflection. The record at speed is a jagged curve composed of a series of rapidly alternating peaks and valleys whose mean line—reduced to the same time scale—corresponds with the "dead slow" curve. The increment in stress or deflection which is due to impact is represented by the height of the peak above the mean line at any point. Now, the vibrations of an elastic body reach a maximum amplitude when the periodicity of the impulses causing vibration coincides with the periodicity of the vibrating body. One would therefore expect to find some regular variation in the record to correspond with a regular variation in the speed of the train. This effect is generally discoverable in the records, but is not by any means regular. The periodicity of vibration of any member varies with the stress in it, and its vibration must be complicated by the vibration of other parts of the structure, all under constantly changing stress. The vibration of a truss, as a whole, varies irregularly as the load moves over. The impulses which produce the vibration in the bridge are not simple, but exceedingly complex. It is probable that the revolving unbalanced masses in the engine driving wheels provide the most important series of impulses, but there are many sources of vibration which interfere and make it difficult to link up a particular effect to its own particular cause, and even when that can be done it is by no means safe to say that the occasional omission of a particular cause will not result in an entirely different manifestation of effects from other causes. For example, the vibrations produced in a 200 ft. truss by the driving axles of an engine will not reach their maximum amplitude until they have been established for some few seconds at least. Assuming that the engine is travelling alone and that its speed is such that the periodicity of its impulses agrees closely with that of the truss as loaded, the amplitude of the truss vibrations will rapidly reach a high value. If, on the other hand, the engine, travelling at the same speed, is followed by a series of train axles irregularly spaced and loaded, these following loads will have the effect of damping out a great deal of the engine effect before it has become clearly evident in the record, so that the impact effect recorded is much less than before, and there is no obvious indication as to what might be expected if the train were omitted.

It is clear that the experiments which must be made for the satisfactory elucidation of the subject of impact may conveniently be divided into two classes. First, a series of experiments on a selected span to show the effects of variation in speed of load, design of engine, composition of load, position of rail joints, condition of track and wheels. Second, the same series of experiments on a variety of bridges to show the effects of variation in type of bridge, span length, relative weight of span and train, relative weight of trusses and floor system, bridge camber and deflection. Other points will no doubt suggest themselves to bridge engineers as worthy of consideration, but those mentioned are sufficient to provide material for many thousands of stress and deflection records. It will be quite clear that the elucidation of the subject involves an immense amount of work and a great deal of expense.

When this work has been done the engineering profession will have definite facts at its disposal in the place of personal opinions. These facts should enable the designer to proportion his structures in the most economical way with greatly increased confidence.

It will be realized that the idea behind this disquisition is that the future development of design is in the hands of the bridge owner and his bridge engineer, rather than in those of the consulting engineer, the professor and the manufacturer. And when the owner's efforts have resulted in an altered specification which reduces the first cost of his bridges, he may be inclined to turn his attention towards the problem of increasing their average length of life. There is no very obvious reason why a steel bridge should be allowed to corrode unhindered for forty years and then be scraped. The cure probably lies in modification of details of design of steel work and its supports, and in improved maintenance organization.

Cost of Supplies for Hamilton, Ont.

The following tenders, each being the lowest bid, were approved by the board of control of Hamilton, Ont., at a recent meeting.

Asphalt sand—Doolittle-Russell & Co., at $1.19 per ton.

Hydrant castings—Canadian Iron Foundries, at $4.95 per hundred pounds.

Bass brooms—Meakins & Sons, at $7.08 per dozen.

Sectional sweepers—Henry Leslie Martin, at $33.50 per dozen.

Pavement brooms—Henry Leslie Martin, at $10.50 per dozen.

Valves—Kerr Engine Company, Walkerville.

Brass casting—Chadwick-Carroll Brass Company.

Crushed stone and screenings—Canada Crushed Stone Company, Limited, and Wentworth Quarries.

Extension boxes—Forwell Foundries, Kitchener. Small size, $2.25; large size, $3.10.

Cast iron pipe and special castings—Gartshore-Thomson Pipe and Foundry Company, at $67 per ton.

The following materials were recommended to be purchased in the open market: Canvas covers, ordinary iron castings, limestone dust, fuel oil, wooden blocks and sewer pipe.

The board recommended that action be deferred to permit a further investigation on the following materials: Sand, gravel, asphalt and road oils.

Tenders were opened for the construction of two sections of sewer on Emerald Street South, and the board recommended that the contract be awarded to the J. D. Armstrong Company, whose tender of $2,207 for both jobs was the lowest. The city engineer's tender of $3,440 was the highest, and the third tender, from J. J. Armstrong Company, being $2,870.

Further Addition to the Paper Making Industry

The New Plant of the St. Lawrence Paper Mills, Limited, at Three Rivers P,Q., was Erected in Record Time — A Detailed Description of the Construction Methods

(Continued from last issue)

Among the necessary things in making a paper mill is an adequate water supply. For a mill the size of the St. Lawrence Paper Mills, with a capacity of 150 tons of newsprint daily, a water supply of good, clean, pure water equal to that of a town of a population of 100,000 is required, without making any allowances for future operations.

The mill is situated on the bank of the St Lawrence River about 1½ miles west of the centre of the town of Three Rivers, and naturally takes its water supply from the St. Lawrence River.

The construction necessary for attaining this adequate water supply consisted of an intake pier and piping and pump house. In order to insure this water supply for all periods in the year—for of course, a paper mill operation is a continuous one—a gravity supply was decided upon. Owing to the contours of the river bed, it was necessary to lay 665 feet of intake pipe 36 in. diam. below water level during the time of construction. This pipe is made in 12 foot lengths and flanged joints were used, two ball and socket joints being installed in the line to allow for unequal sinkage or deflection in the piping. This pipe connected the intake pier and pump house sump together.

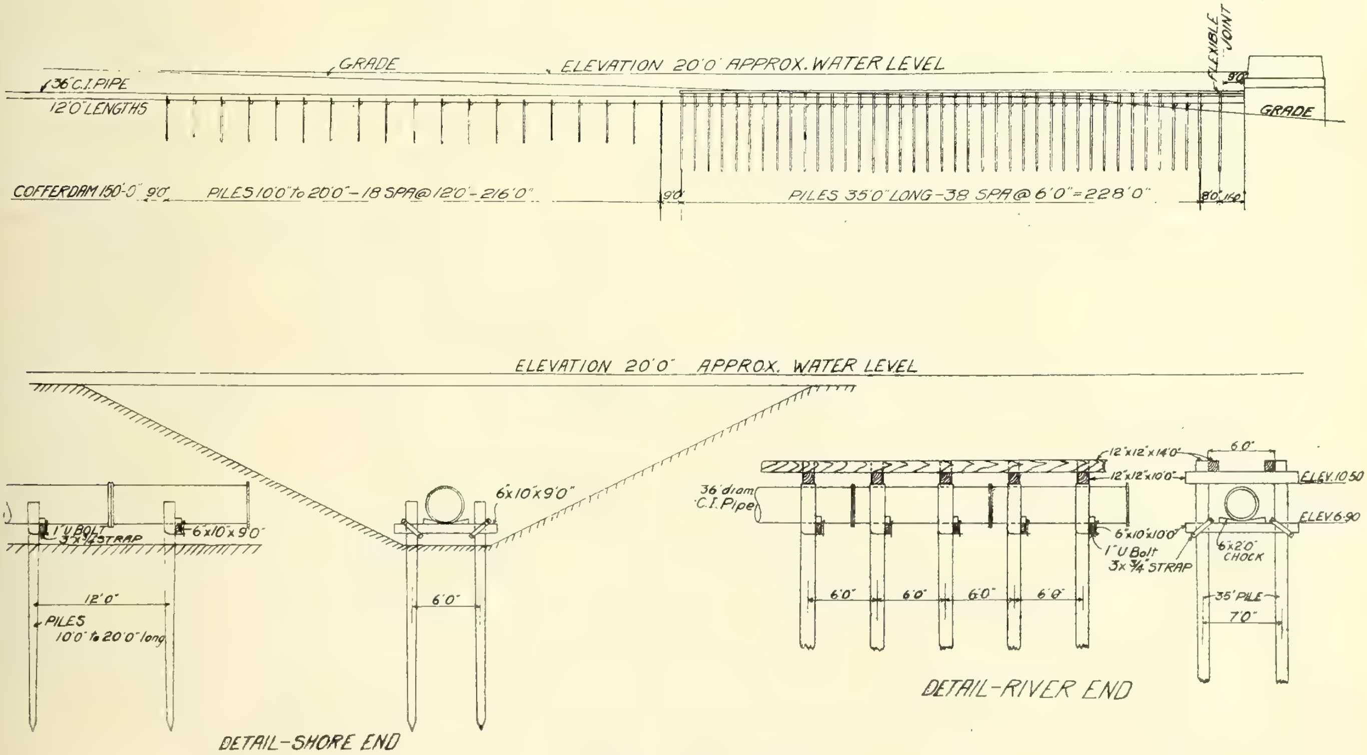
The pump house and intake pier were constructed by the Foundation Company of Montreal, under contract with the owners, and the designs were prepered and the general construction work supervised by the Engineering Department of the St. Lawrence Paper mills Ltd.

The intake pier consisted of a timber crib made of 12 x 12 fir, rock filled, capped from the low water level to its top elevation with concrete. The pier is 48 feet long by 36 feet wide in the body, and is properly protected against ice with the usual sharp nose. The crib itself, which is about 16 feet high, was built on the shore, launched and floated to its existing position against guide piles. In addition to that through the various pockets inside the crib, a considerable number of piles were driven to insure its location. These piles extended up into the concrete cap. The concrete was all poured in the dry, an open form being built on shore and floated out over the pier and sunk on it, then being pumped dry previous to the pouring of concrete. About 450 yards were poured in this manner.

The Intake Pipe

The intake pipe was laid length by length in a trench excavated partially by river dredge and partially by dipper and derrick. Some 15,000 odd cubic yards of excavation was necessary.

The pump house is box and diaphram form of construction, wholly of concrete, consisting of a sump 50 feet long and 6 feet wide and a pump well 50 feet long and 20 feet wide. No water proofing was used in the concrete mixture which was made of carefully graded aggregate and Portland cement only. No leaks whatever developed in spite of the fact that the bottom of the pump pit has been under a head of 20 feet to 25 feet of water since construction, the only



Details of the intake pipe

seepage having taken place at a few of the construction joints which were not water-proofed until after the general construction of the pit.

Unusual Features

The engineering staff of the St. Lawrence Paper Mills Ltd., had been engaged for some time before the start of construction in the preparation of designs and plans and they have introduced several unusual ideas concerning plant design. These were touched on briefly in preceding paragraphs; such as the windows, floor surfacing and stock tank design.

In regard to construction there was nothing about the general group of buildings which offered any of those problems which engineers and contractors have to sit down and worry about. But the pump house and intake pipe and pier were of special interest on account of the unusual soil conditions and the means adopted to overcome the difficulties. The sub-soil around Three Rivers is composed mainly of very fine sandy loam. The ground water level is very near the surface and this sandy loam is saturated with water to the point where the whole mixture is in an extremely easy flowing state. It has the general characteristics of a body of water except that it is heavier per equal volume, and will displace water if the excavation is left open. The contractors had previous experience in the neighborhood and knew what to expect, so they worked out their plan of action accordingly.

Trouble With Boiling Sand

They drove 6 in. x 12 in. fir, tongue and groove, sheet piling on a line well outside the walls of the pump house so that if this piling did not completely resist the pressure an additional ring of sheet piling could be driven inside and thus enable them to carry on. It so happened that their fears were realized and though the outside piling was not greatly displaced the mixture boiled in and up from the bottom. They then drove the inner ring of sheet piling using the same material, and the same methods, but driving considerably deeper to try and find solid footing. The boiling up from the bottom still continued and it was necessary to flood the excavation with water to act against it while they were excavating to the proper level. The fact is that they were obliged to excavate about 3 feet below the sub-basement level and place a thick mat of concrete, covering the entire area inside the inner ring of sheeting. This was placed under a 25 foot head of water and was the only way to effectively stop the bubbling of the sand. When this sub-floor or mat had thoroughly set the excavation was pumped dry and the remaining work quickly finished. There were times during the work when it appeared that they might have to abandon their plan for some other, but perseverance won the day. A regular steam pile driver was used for the greater part of the driving, after it was found that the smaller type of hammer was not suitable. As the excavation was carried down additional whaling pieces and braces were placed in position to guide the sheet piling and hold it in place. This bracing became stronger and occurred at shorter intervals, as the bottom of the hole was carried down, to offer the necessary resistance to the static head exerted on the outside of the sheeting. This head cannot be rightly called hydro static as the presence of so much sand in the suspension would make it greater than hydro static.

Laying the Intake Pipe

It is interesting in this connection to describe the methods used for laying the 36 in. dia. intake pipe from the intake pier to the pump house. The river bed from shore line to intake pier sloped gradually until a depth of about 20 feet is attained at the intake pier, 650 feet from the shore. Having decided on a gravity flow into the power house it was necessary to at least keep the pipe on an even keel to assure a continuous water supply at all times. This meant that the pipe would have to be raised above the river bed for a part of the way near the pier and then in due course it would meet the river bed and from this point on would be below natural river bed.

That part of the pipe which comes above the river bed elevation is supported in cradles which are in turn supported on piles. Also a considerable length which comes below river bed is supported in the same way, the piles having been driven and the cradles attached after a trench had been excavated in the soft sand of the river bed. For the last short distance, say 150 feet nearest to the power house, the pipe was laid without the use of piles or cradles. In this case 4 in. by 12 in. fir tongue and grooved sheeting was driven on both sides forming a steep sided trench in which the pipe was laid. Light bracing was placed between the lines of sheeting to take care of the difference in head when the sand was taken out of the trench. This trench was always flooded up to the wall of the pump house.

The equipment used on all of this work consisted of a pile driver with a special circular saw arranged so that cut off of the pile could be made at any point under water; a river dredge to dredge out the outer section of trench; and a clam shell bucket mounted on a barge to excavate in the narrow trench formed by the parallel lines of sheeting. All underwater work, such as fastening cradles to the piles, connecting up the pipe lengths, etc., was done by a diver who maintained an average speed of 3 lengths, 36 feet per day once the work was well under way.

The accompanying cuts show the method of making cradles and attaching them to the pile bents. That part of the pipe which comes in the trench, about 400 feet, was covered with earth again when the work was finished.

Montreal's Stone Contract Comes in for Criticism from Builders

Feeling that the present contract between the City of Montreal and the Maisonneuve Park Commission, Limited, regarding crushed stone, is an imposition against Montreal taxpayers and contractors of the city, a delegation from the Builders' Exchange waited upon the Executive Committee recently and asked for its modification.

Bearing date of March 26, 1920, a contract had been made whereby all crushed stone required for city contracts shall be bought from the Maisonneuve Park Commission, Limited, the contract stating that 500,000 tons of crushed stone must be purchased in five years. Under date of October 26, 1921, the contract was amended so that the time limit in which the 500,000 tons must be bought was extended to ten years, but should this amount be bought before the expiration of the ten years the contract will continue.

While it was recognized by the Builders' Exchange that the contract had been made and cannot be overcome, the object of the delegation was to have the contract amended so that crushed stone bought over and above 50,000 tons a year, may be obtained from other quarries than from the Maisonneuve Park Commission. The 50,000 tons would be needed each year to aggregate the 500,000 tons stated in the contract. The grievance was that contractors needing crushed stone in other parts of the city and district than Maisonneuve find it inconvenient to obtain the product from that section solely.

A Restraint on Business

Douglas Bremner, president of the Builders' Exchange, addressing the committee, said that for the past two years clauses had been inserted in contracts for public works for the city of Montreal, which were a restraint on business. This was due to a contract compelling the city of Montreal and contractors doing work for the city to buy crushed stone from the Maisonneuve quarry. The result of this contract was that the stone was costing 30 cents a ton more than if bought in the open market. As a result public works, whether done by the city of Montreal or by contract, were costing more than necessary. While it was true the quarry was the property of the city of Montreal, and was being operated at a profit, there was, on the other hand, a serious loss on such public work, whether undertaken by the city of Montreal or by contractors for the city. If the city of Montreal obliged a tenderer to pay 30 cents a ton more for crushed stone than necessary, such a contract for city public works must cost more, and the extra cost be borne by the city and the taxpayer. This original contract, he said, was made between the Maisonneuve Park Commission and a firm operating the Maisonneuve quarry and was for a period of five years for the entire supply of crushed stone needed by the city of Montreal for all its public works. After it had been in existence for a year and a half, it was extended for another ten years, and this was done two days before the former Administrative Commission of Montreal, which controlled the Park Commission went out of office.

In order to show the injustice of such an agreement, Mr. Bremner remarked that it had created a monopoly on the supply of crushed stone for ten years, and as a result all the other legitimate quarry owners were prevented from sharing in this extensive business of the supply of crushed stone for city contracts.

It was also stated by R. F. Dykes that the cost price of the crushed stone by the Maisonneuve Park Commission is 30 cents per ton more than the price charged at other quarries. Mr. Dykes pointed out that this represented a total of $150,000, on the total of 500,000 tons, and had to be paid by the civic treasury, as the contractors paid merely the market price.

French River Canal and Power Development

Renewed Interest Being Taken in a Project that is Regarded by Many as an Ultimate Necessity—Three Locks Necessary for Navigation, at the Sites of which 35,000 h.p. Could be Developed

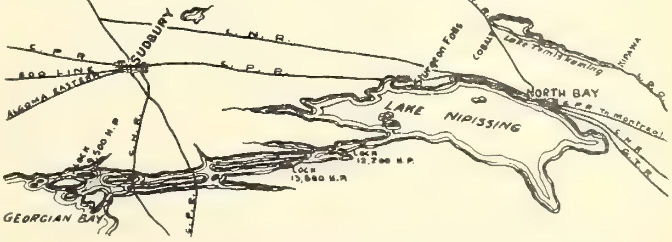
By Ottawa correspondent

Senators Bennett and Casgrain, at the present session of Parliament, put themselves on record against the deepening of the St. Lawrence river. They strongly favoured instead the development of trade for our railways. They spoke at length on the merits of the Georgian Bay ports, urging better transportation means from the latter ports to Montreal and St. John. "Are we going to continue," asks Senator Bennett, "to haul grain to Port Arthur and see it shipped from there to Buffalo?"

Development Has Been Frequently Urged

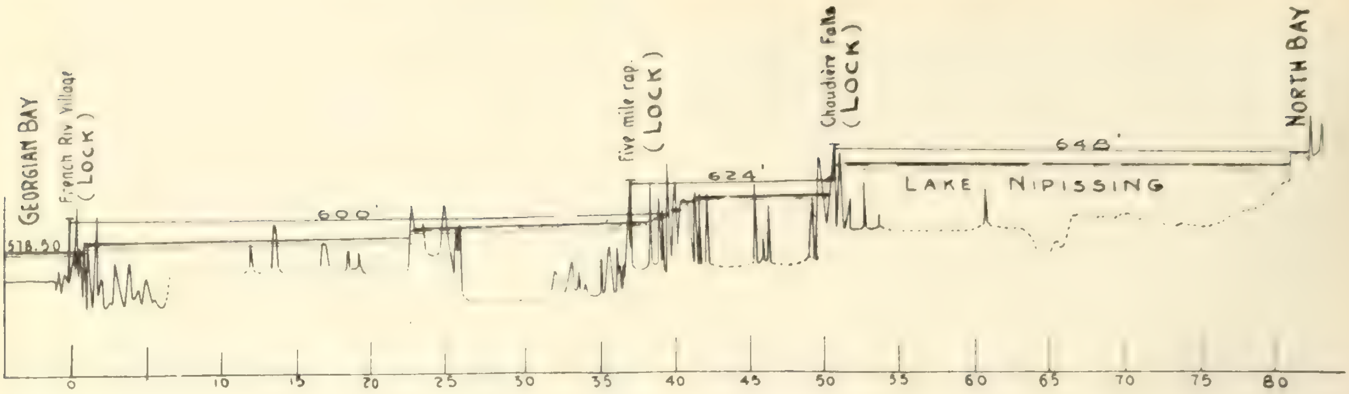
The French river and Lake Nipissing were long ago looked upon as the natural outlets for our western trade. The head of the Great Lakes and the east end of Lake Nipissing were considered by reputed engineers as being the two strategic points to be reached in connection with eastern and western railway terminals. Mr. W. Shanly, a well-known engineer, recognized in 1859 the advantages of the opening up of the French river, and Mr. Marcus Smith declared, after a careful survey of the ground in 1895, that the route from Lake Superior to Montreal by way of North Bay was more nearly an air line than any other stretch of inland navigation in the world. The full merits of the French river improvements were carefully gone into some 3 or 4 years ago by the Associated Boards of Trade of Northern Ontario, the project being then also endorsed by prominent business men of the country, as being a needed water-way by which all provinces of the Dominion would benefit.

An influencial delegation from Northern Ontario again assembled at the Parliament Buildings at Ottawa at the beginning of the present session, for the purpose of putting before the Federal authorities, the absolute necessity of the immediate development of the French river. With the advice of Mr. A. E. Lapierre, member of parliament for Nipissing, it was agreed, however, to limit the present demand upon the government for an appropriation to cover power development only rather than to press further for the larger project of canalization of the entire river at once.



Map of the French river district

The delegates, numbering twenty and headed by



Profile of the Georgian Bay—Lake Nipissing route

Mr. Dan Parker, chairman of the French River Power and Development Association, were most favourably received by Sir Lomer Gouin, Minister of Justice and Hon. J. H. King, Minister of Public Works. In introducing the deputation, Mr. Lapierre emphasized the seriousness of the power shortage in Northern Ontario. At present the large corporations are in control of and using all the available power in Northern Ontario, that is 194,000 h.p., and the whole future of the north depends largely on the availability of more energy for use by the municipalities there.

The demand upon the government for an appropriation for the proposed improvements was made in the form of a memorial, the principal points being that the development of Northern Ontario is being seriously hampered by lack of adequate power development; that the opening up of the waterway would be of the utmost benefit to Canada in providing needed power and cheap water transportation means for the mining and other industrial areas of Northern Ontario; as well as providing an economical route for the western grain traffic.

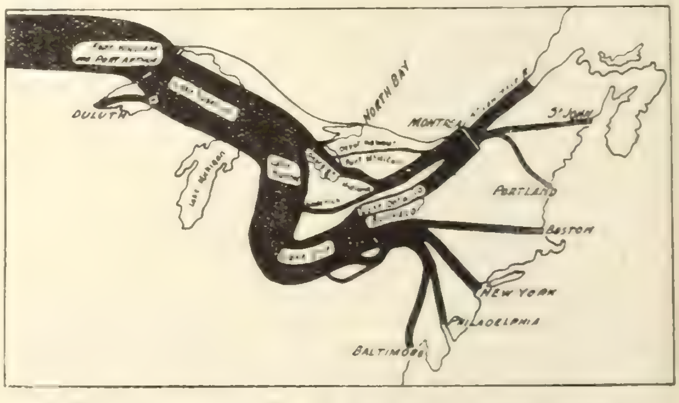
Power Development of the River

The French river is one of the large streams supplying the inland reservoir of the St. Lawrence. It has a drainage area of about 10,000 square miles. At the head of the river, lies Lake Nipissing offering a storage reservoir of an area of 320 square miles, having excellent permanent reserves to preserve its supplying sources. The stream lends itself to comparatively inexpensive development. The river's broad, open reaches are interrupted at three points: the Big Chaudiere Falls, the Five Mile Rapids and the Dalles,—and between these points lie deep water channels affording free navigation throughout their entire lengths of 12 miles, 13½ miles and 37 miles respectively. The three locks necessary to overcome the breaks occurring along the waterway, could generate a minimum of 35,000 h.p. The work of the improvements would not present any engineering difficulties and could be completed in a comparatively short time. It may safely be said that the electrical power developed at the lock sites would provide sufficient revenue to meet the interest on the entire expenditure of canal and power development, taking the lowest possible rate of $30.00 per horsepower, leaving aside the enhanced value of the immense areas of resources of the north.

Improvements to Navigation

It is doubtful if any section of Canada or the United States is as rich in natural resources as is this section that is requesting water-borne traffic for its imports and exports, and no other improvements would help our national railways east of the western provinces, as much as those suggested on the French river and Lake Nipissing. The shortest rail haul from the Great Lakes to Ocean is from the east end of Lake Nipissing. It is the shortest Great Lakes to Ocean grain line in America. The distance from Georgian Bay to North Bay is 83 miles and the sailing time for that distance, including time required for lockage could easily be done in 10 hours. The waterway also would provide a safer route; from the mouth of Lake Michigan vessels would pass under the shelter of Manitoulin Islands to the mouth of the French, avoiding all the dangers of Southern Lake Huron. Lake Nipissing is noted for its clear weather. Deep water protected harbours with ample room for the largest carriers exist along the northern shore of the lake where our railways have acquired large areas of water frontage.

The section benefited by the French river improvements is backed by a mining tonnage unequalled in Canada besides paper and pulp shipments and other commodities which will go water-borne to the United States. It is estimated that the saving on coal alone would equal the cost of the improvemets in quite a short time.



How traffic from the West is distributed to seaboard points

A certain amount of improvement has already been done on the French. The Federal Government has built two dams so far. The amount expended to date totals $209,400 and it is understood that the necessary money for the completion of the Federal Government's share of the improvements will be provided for in the estimates of the present fiscal year.

Standardized Bituminous Materials

The Advantages of Standard Specifications—Their Absence Leads to the Use of Unwarranted Test Limits—Simplification of Asphalt Grades Would be an Improvement

By PREVOST HUBBARD*
Chemical Engineer, The Asphalt Association

The advantages of standardizing specifications for any and all materials of construction, when practicable, are so evident as to require but brief comment as related to the asphalt industry. In the first place such standardization makes for uniformity in marketed products. The producer knows in advance just what products he will be called upon to supply and is able to keep on hand sufficient stock to fill orders promptly as received. This makes it possible for refinery operations to be conducted in a uniform manner thereby reducing the cost of such operations and at the same time eliminating unnecessary and expensive storage facilities. The cost of production is of course reflected in the market price of a material and in this connection standardization always works to the advantage of the consumer. Moreover the consumer is practically assured in advance of the quality of the material which he will receive after placing an order and the expense of inspection may be kept at a minimum, as on standardized products a few simple check tests practically insure conformity with most of the other essential requirements. He can also obtain small quantities of materials as readily as large quantities because the producer always has a stock on hand from which to make delivery. To sum up, the principal advantages of standardization are lower costs, prompt service, convenience of inspection and assurance of uniformity.

Either Store Heavily or Refuse Some Markets

On the other hand, if the producer is faced with a great variety of specifications he must either refuse some markets, to which he should have convenient access in order to create competition, or he must be constantly changing his plant operations, thereby creating opportunity for mistakes of a more or less serious nature to himself as well as the consumer. He must be equipped with expensive storage facilities if he wishes to maintain sufficient stock of each variety of product to fill orders promptly and he never knows when some apparently slight modification of an existing specification may eliminate materials which he is carrying in large quantities and thus cause considerable loss. If he does not carry stock on hand it is often difficult if not impossible, to fill orders promptly and many small orders must be refused as it would not be profitable for him to turn out a still of material on an order for a few barrels or even tons.

Too many engineers and chemists play with asphalt specifications as though the various requirements were independent units which could be varied at will. As a matter of fact most of the properties covered by test requirements interlock to a considerable extent so that unless the test limits are very broad a change in one requirement effects a number of others. An apparently slight modification of one existing requirement may therefore throw the entire specification out of joint if the test limits are narrow. Theories or preferences unsupported by service or other data are often the basis of ill advised changes in existing specifications or the formulation of new and unusual requirements. Standardization of specifications with general acceptance of such standards does not prevent changes in requirements as they become advisable or necessary but does head off changes which might otherwise be made without sufficient supporting evidence. Standardization therefore means stabilization which is in the interest of both producer and consumer.

Unwarranted Test Limits

Absence of standardization frequently leads to a generally unwarranted and sometimes corrupt practice of drawing test limits so as to admit only a single trade product and eliminate other products equally as good and perhaps better adapted for the particular use to which the material is to be put. Such specifications in effect create a monopoly which almost inevitably leads to unjustifiably high cost to the ultimate consumer and may be used by the unscrupulous as a basis for offering or demanding graft. This is a danger which should be eliminated, if possible.

Although other arguments might be advanced it is believed that enough has been said regarding the advantages of standardization, if practicable, and it therefore remains only to consider the practicability of such standardization as applied to asphalts for use in highway engineering. To do this intelligently it is necessary to give some thought to the origin, method of refining and essential characteristics of asphalts as determined by tests and to take into account existing conditions in the asphalt industry which have a bearing upon the output of available products.

In the first place it is a recognized fact that all asphalt originates in petroleum, whether produced by natural agencies or at a petroleum refinery. In general asphalt may be defined as a semi-solid or solid sticky product formed by the partial evaporation or distillation of certain petroleums. These petroleums originally contained the asphalt dissolved in relatively light volatile oils. Natural evaporation of these lighter oils at or below the earth's surface has produced deposits of lake asphalt while their removal by distillation in a still at a refinery produces the so-called petroleum asphalts. There is no essential difference between lake asphalt and petroleum asphalt except that the former during its process of formation has become mixed with varying amounts of vegetable particles, clay, silt, water and gas, while petroleum asphalt is practically free from such materials.

Refining of Asphalt

Lake asphalt must always be refined before it is suitable for paving purposes, first by heating and agitating it to remove the volatile impurities. It is then too hard for use and must be softened to suitable consistency by combining it with a petroleum residual oil known as flux. Petroleum asphalt on the other hand is recovered at any desired consistency by merely distilling off the proper amount of oils which hold it dissolved in the crude petroleum.

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*Presented at the New Jersey State Highway Convention.

The principal sources of supply for paving asphalt are Mexican petroleum, California petroleum, and two lake deposits, one occuring on the Island of Trinidad and the other, commonly known as Bermudez asphalt, occurring in Venezuela. In addition a considerable amount of asphalt is refined from a mixture of Mexican and domestic petroleum. It is possible to identify asphalts from each of these sources by means of certain tests and it is therefore possible to prepare individual descriptive specifications for products from each source. Service results have, however, demonstrated that these purely descriptive tests or test limits are not necessary as a guarantee of quality under existing refinery practice and that comparatively few test limits, which have nothing whatever to do with origin, are sufficient for all practical purposes. This fact has for some time past been recognized by the American Society for Municipal Improvements in its specifications for asphalt for sheet asphalt pavements, and has been adopted as a basis for the tentative specifications of the American Society for Testing Materials.

Essential Tests Only

General elimination of origin requirements or test limits in asphalt specifications constitutes a first long step in the matter of standardization as it paves the way for the adoption of essential tests only and makes it easier to agree upon the test limits which should be used. While it is impossible, in the time allotted for this paper, to discuss in detail all of the tests and test limits found in asphalt specifications the possibilities and the progress already made in the matter of standardization may be illustrated by comparing present specifications for asphalt for sheet asphalt pavements of the American Society for Municipal Improvements, the American Society for Testing Materials and The Asphalt Association. A tabulation of the test requirements of these specifications is given below:

TEST	A.S.M.I.	A.S.T.M.	ASPHALT ASS'N.
1. General	Homogenous & free from water	Homogenous & free from water	Hamogeneous, free from water, not foam at 347°F
2. Flash point not less than	350 deg. F.	347 deg. F.	347 deg. F.
3. Penetration at 77° F. ..	25 to 45 (a) 45 to 70 (b)	40 — 50 50 — 60 60 — 70	30 — 40 40 — 50 50 — 60
4. Ductility at 77° F. not less than	30 (c)	30	30
5. Loss at 325° F. 5 hrs. not less than	3%	2%	3%
6. Penetration of residue in per cent of original penetration, not less than .. .	50%	60%	50%
7. Proportion of bitumen soluble in carbon tetrachloride, not less than		99%	99%

Notes, (a) heavy traffic, (b) light traffic, (c) increased ductility of 2 required for every 5 points penetration above 50, and allowance of degree of 2 made for every 5 points penetration below 50.

In this tabulation it will be noted that there are seven tests enumerated, six of which are common to all three specifications. In all three the limits of requirements 1, 2, and 4 are practically identical, and it is evident that the slightest differences in test limits of requirements 5 and 6 might be readily harmonized. As a matter of fact if a single composite specification were prepared from all of these requirements selecting the limits which were most restrictive it is believed that the result would be quite satisfactory for both producer and consumer. It is to be hoped that the various provinces, states, counties and cities will get behind this effort to standardize and thus eliminate the unnecessary variations in many existing specifications.

Reduction of Number of Grades

One very important feature of the standardization of asphalt specifications has to do with the simplification or elimination of grades. For paving purposes asphalt cements are graded according to their consistency or degree of hardness as determined by the penetration test. Penetration limits are therefore an essential part of all asphalt specifications.

In an article appearing on page 539 of the Sept. 8, 1922 number of Engineering News-Record the existing variation and multiplicity of asphalt specifications is discussed at some length with particular reference to penetration limits. The following is quoted from this article as of essential interest in this connection.

"Eliminating factors of lesser importance the keynote test for asphalt quality is that of penetration and in any effort to secure greater uniformity in specifications the first effort should be directed toward a reasonable standardization of penetration limits. Many states fix a range at 10 points for a given grade; some of them use an even scale, from 50 to 60, for example, while others adopt odd scales, as 55 to 65. In some recent cases an 8 or 9 point range is specified. In other cases very wide limits of penetration are specified, with the notation that within this range the exact penetration will be set by the engineer. Such a requirement places the producer at a great disadvantage as he does not know what limits will be set by the engineer."

Present Grades Overlap

As the result of practices above quoted existing specifications call for a greater number of overlapping grades of asphalt some of them with unnecessarily narrow and some with unnecessarily wide penetration limits. It is believed that this condition might well be remedied by the general adoption of six or seven clearly defined grades which do not overlap and which are sufficiently comprehensive and at the same time sufficiently restrictive to insure suitability for use in the various types of asphalt pavements under different climatic and traffic conditions.

Is the Road Building Business in Disorder?

A Correspondent Sees a Pressing Need for Some Improvements in Highway Contracting and the Institution of Reforms in Many Practices that are Now Disadvantageous

This article which is submitted by Henry H. Wilson, managing partner of Winston and Co., contractors of Muncy, Pa., contains some important suggestions that are worthy of publication. In Canada, however, we do not think that the highway construction situation is as gloomy as he pictures that in the United States to be, but in order to give our readers an insight into conditions there this article is published. It contains several thoughts that are worth considering seriously.

When it comes to advocating the interests of highway builders, the writer freely admits that he is without "Terminal facilities." Among others, he has for the past twelve months preached, by tongue and by pen the dangers of enhancing hazards, arising from a constantly increasing scarcity of labor, a rising market, an unprecedented car and motive power shortage continuing into this year and a coal and road material situation largely dependent thereon. Results last year showed that about as much attention was paid to warnings issued from many quarters, as to Noah who, for one hundred years predicted a flood, without safety measures being taken by any of his hearers.

Season Opens Gloomily

The construction season of 1923 opens gloomily for road makers. From partial estimates received from state highway departments in nine states, including the Atlantic Seaboard from New York to North Carolina inclusive, Ohio and West Virginia, it would appear fair to assume that approximately one hundred million of uncompleted highway work has been carried over from 1922 to 1923 in those states and that upwards of one hundred and fifty million additional is to be spent on new work this year.

It is reported that, at a recent large letting, mostly of concrete roads, cement salesmen were chiefly conspicuous by their absence. Last season more than one of these companies had its surplus stock practically exhausted by the coal strike. With reduced reserves and a tremendous amount of delayed contracts on their books, it is not surprising that the better class of cement producers should look well to the matter of taking care of present customers and hesitate to load their books with new orders, until such ominous possibilities as the car shortage and its effect upon the coal situation as well as other undeveloped factors, such as the season's wage level, reveal themselves more fully. Current dispatches report growing scarcity of common labor and further advances in wages by large industries to offset same. Steel companies are said to be booked months in advance of their production, various commodities are reaching new peaks and the vicious circle of prices from which the country revolted in 1920 whirls past to prepare a "Roman holiday" for many who will prosper on the misfortunes of those "short of the market" including luckless road builders with 1922 contracts still undigested. Some states in the territory referred to herein, have most unwisely delayed lettings and early placing of their requirements for maintenance and resurfacing aggregates, thereby adding to the peak of the load for both the carriers and producers and injecting another element of uncertainty into the car situation in particular localities.

Disastrous Prices

It is a matter of public comment that prices for road construction last year extended below the danger point and reached a level which was an astonishment to the engineers taking the bids. Under these conditions, an enquiry into the reasons for this apparent casting of all caution to the winds is not untimely. According to H. J. Knolling, highway construction engineer in Wisconsin (and many other engineers and constructors for that matter) a leading reason was that: "News of profits made in 1921 became noised about, with the result that many new contracting firms sprang into being over night. The competition of these newcomers, confident in their estimates predicted on conditions in 1921, one year in a decade in its conjunction of conditions favorable to construction operations, stampeded road contractors into slaughter of prices." As has been well said: "The contractor must contract" and "Fear of being without a contract again demonstrated its power to fix the charge for doing that work." The Secretary and Attorney of the Ohio Contractors Association is authority for the statement that, in that state last year, prices reached a level below actual estimated costs for doing road work. There is a significance, beyond the late coal strike and car shortage, in the fact that, Ohio enters 1923 with approximately $17,000,000 of uncompleted work, and has endured much complaint regarding delayed and unsatisfactory work. Other instances could be cited ad infinitum.

The Reason

In a recent address, Robert W. Wolley, ex-Interstate Commerce Commissioner drew, with striking clarity, the following lesson from the facts set forth above:

"In a stabilized industry the conditions indicated could not exist. Highway contracting is not stabilized. It lacks knowledge of equipment performance, relative efficiency of methods and reasonable costs. It has not evaluated influences that control progress. It has accumulated no general fund of quantitative information which indicates the boundaries of prices and profits. It has no established business policy. Its practices are individualistic and erratic. What happened early in 1922 is a natural consequence. It will happen again and again until contractors organize to sabilize their business policies and to determine the efficiency factors of their tasks." One of the country's most prominent highway officials and experts, is authority for the statement that, in one state, an analysis of bids for road work, during the last four years, shows an average difference of approximately $15,000.00 between the lowest bidder and the next lowest.

No One Begrudges a Fair Profit

It is well to repeat Mr. Woolley's words: "In a stabilized industry, the conditions indicated could not exist." As the laborer is worthy of his hire, so is the contractor worthy of a living scale of prices and a modicum of protection from senseless cut-throat competition, proceeding chiefly from ignorance.

Only those highway officials who labor under the delusion, older than King Tut-ankh-ahmen, of getting something for nothing, and who prefer a disorganized, irresponsible and transient aggregation of road builders, will read these utterances with negative concern. The constantly repeating experience of twenty years of modern highway construction points an imperative finger to and importunes the conclusion that the contractor must be saved from himself and selfish interests concerned with road building who have imposed upon the artlessness and credulity of the annual crop of new concerns for whose development the business appears to possess a fatal fecundity. The financial history of hard surfaced road building constitutes a fitting eulogy upon the everlasting truth of that well worn adage, "They that live by the sword shall perish by the sword."

The writer does not attempt to speak for anyone other than himself. He is a "free lance," devoted mind, body and breeches to the legitimate aims and interests of highway builders. It is common knowledge however, that all right thinking constructors are opposed to price fixing or collusion in any form. The thinking public and ourselves both know that price fixing, aside from being unethical and unlawful, is absolutely impracticable of accomplishment in a nation wide industry composed of such multitudinous units as is ours. Organized construction, under the leadership of the Associated General Contractors of America, favors all measures calculated to strengthen the hands of officials and engineers in securing quality and perfection of work. The most ordinary intelligence can perceive that, uniform enforcement of specifications, without fear or favor, places a premium upon the road builder who properly evaluates his obligations before submitting a bid.

In addition to its stand as to quality of work, organized construction is moving for the reform of many practices which are believed to have been largely responsible for constant demoralization in our craft, such as unduly indeterminate hazards in contracts, publication of misleading cost data, partisan control and policies on public work and refusal of compensation for contingencies incapable of anticipation. It is advocating arbitration, reduction of unnecessary interest charges, reform of present bonding practices, standardization of specifications equipment and methods within practicable bounds and is cultivating increase of technique, efficiency, etc., within its membership. These policies are believed to be the surest means for placing at a disadvantage those bidders whose prices are based on thoughtlessness, ignorance, the hope that something may "turn up" or escape through political manipulation.

Passing the Buck

Business has an almost uncanny facility for passing every burden back to the taxpayers—witness our income tax for the improvement of which we hear so many contrary remedies suggested nowadays. What is lost by constructors, surety companies, banks, manufacturers, material producers and others interested in unprofitable highway contracts is more often than otherwise passed on to the taxpayers and consumers in some other form. The recent death of John Wanamaker furnishes a striking case in point. His life was insured for three million dollars to pay death taxes on his part of the great business which could not be turned into cash for the tax gatherer without the destruction of Wanamaker's as a going concern. The sooner highway officials, engineers and all others interested in construction realize that their interests and those of the taxpayers are parallel with the new movement among contractors, and the sooner they unite to give us the strength of their whole-hearted moral and active support in spreading the gospel of skill, integrity and responsibility, which we have emblazoned on our banners, the better it will be for all. The taxpayers have an interest in seeing this movement furthered and will eventually be the beneficiaries. As that great editor of finance and business, C. W. Barron, recently remarked, "We are groping towards better things and may even one day arrive at a stage of growth, where we can say man is governed by sacrifice and service. Our material progress has been enormous and our moral progress singularly lacking. It will be the astonishment of the historian of the future that the real obstacles of development and growth, expansion, enterprise and government were so often self-imposed by a self-governing people."

Organized construction really wishes to serve the public as well as itself. Its leaders are endowed with enough vision to visualize that only those measures are worth while which are in consonance with the interests of the taxpayers and that it is idle to attempt that which is economically unsound with any hope of ultimate benefit or success. We are still prone to kick a man when he is down. Road builders can freely admit their own shortcomings and still maintain that room remains in the business for less cave man tactics upon the part of the officials, engineers, vendors, etc., and more of the Golden Rule. It is only a question of time until the public will fully agree with us (if it does not already) that it cannot afford to have one of the country's greatest industries in constant disorder and that the situation must be treated more sympathetically and intelligently by all interested.

Nothing reaches the lime-light with the same facility as success, and nothing seeks cover sooner than failure. Neither constructors themselves nor other road building interests will do much to assist in spreading news of losses from 1922 contracts, in the same way that they broadcasted information regarding 1921 profits. It is, therefore, our individual duty to ourselves and our craft to see that the lesson is not lost or forgotten. It is also opportune to suggest that highway builders would do well to 'look before they leap' into the 1923 construction season. Legitimate and enlightened self-interest or perhaps we should say, enlightened effort at self-preservation against disintegrating forces can certainly not be questioned.

Canadian Comstock Co. Open Office

The Canadian Comstock Company Ltd., have opened an office at Room 28, 18 Toronto Street, Toronto, under the management of Mr. Wm. C. Hall.

Consumption of Cement

Amount Used in Canada During 1922 Was Greater than in 1921 but Still Considerably Below 1913's Figure—Cost of Cement

By FRANK P. JONES
President and general manager, Canada Cement Co., Ltd.

The consumption of cement in Canada for the year 1922 shows an improvement over 1921, and while I believe the corner has been turned, and we are now on the up-grade, still the cement industry is not in a satisfactory condition, mostly due to the following facts:

On account of the war and the depression which followed, Canada's consumption of cement in 1922 was 38 per cent. less than it was in 1913; her producing capacity is now two and one-half times greater than the consumption. Therefore the cement industry is in a position very similar to that of Canada's railways, viz.: it is overbuilt, and until the demand is such that the factories can operate more continuously, prospects are not bright.

It is generally stated that the only salvation for our railways is a vigorous immigration policy, so as to increase Canada's population, and thereby give the railways more business. This would be a great help, provided that the immigrants are settled on the land and become profitable producers.

There is no question that the cement industry in its present overbuilt state depends entirely on the development of Canada. While cement might be more largely used, it is not reasonable to expect the increased use per capita to take care of the idle producing capacity, therefore the industry depends on increased population and a prosperous population that will have a purchasing power.

Depends on the Farmer

The price of farm products has deflated more rapidly possibly than any other line of business, certainly more rapidly than most lines of business. The result is that unless the farmer can produce more cheaply he cannot be as prosperous as he should, and until he is, this country cannot have the prosperity it should have. If the farmer is not prosperous, it is doubtful if Canada can get and retain a large flow of immigration. Undoubtedly, a great help to the farmer would be, if possible, to sell his produce at better prices. If this cannot be done, he will have to pay less for what he has of necessity to buy—supplies of all kinds, transportation, coal and labor. Can the farmer expect to get better value for the money he spends on labor, coal, transportation, etc., so long as the coal miners and transportation companies pay the present rates of wages for restricted hours of work?

The duty on cement coming into Canada from Great Britain is five cents per hundred pounds. From the United States it is eight cents per hundred pounds, which to-day is approximately 15 per cent. on cement coming from the United States.

The large items in the cost of cement are labor, coal, transportation, repairs, sacks, taxes, interest and depreciation. Compared with 1914, labor is up 90 per cent., slack coal 400 per cent., transportation about 90 per cent., repairs 90 per cent., sacks 100 per cent. and taxes 600 per cent.

Most of the coal used in Canada to manufacture cement is imported from the United States, therefore the increased cost of transportation bears more heavily on the Canadian mills, which are situated closer to the coal fields. In addition to this, on account of the population of Canada being more scattered, the transportation cost of each barrel shipped to the consumer is much greater than it is in the United States.

Sacks in the United States are cheaper than in Canada, the duty on empty sacks coming into Canada being 35 per cent.

In Canada, during the winter months, shipments of cement drop 90 per cent., therefore, when building a factory in Canada, stock houses for cement, sacks, etc., and shipping capacity have to be from 60 to 100 per cent. larger than they would be in a similar mill situated in the United States. As most of the machinery, structural steel, etc., used in a cement mill is imported from the United States and bears a duty of from 27½ to 35 per cent., the cost of building a mill in Canada is, therefore, greater than a similar mill in the United States, and, as above stated, the mill in Canada has to have larger storage capacity for cement, sacks, etc., and greater shipping capacity. The mill in Canada will, therefore, cost at least from 25 to 40 per cent. more than a mill of the same capacity in the United States. This additional cost means larger capital investment and depreciation per barrel.

In the past Canadian mills had some advantage over United States mills on account of being able to get cheaper power, but this advantage has disappeared by the introduction of the waste heat boilers, that is, boilers which use the waste heat from the kilns are used to produce steam, the result being that to-day many of the United States mills are getting power as cheaply, and in some cases cheaper than Canadian mills.

Canada an Importer up to 1912

Up to 1912 Canada was an importer of cement. This condition, on account of Canada having overbuilt, has changed, and Canada is now an exporter of cement, but the export business cannot be developed to any great extent on account of the freight rates from Canada to most of the foreign markets being higher than they are from competing points, mostly caused by steamers not having return cargoes to Canada. This is largely brought about by our importing via United States ports. For example, practically all the coffee, cocoanuts, South American hides, Quebrecho extract, wool, etc., are imported via New York and Boston, thereby giving the American ports and railways the business so much needed by our railways and also preventing Canadian exporters getting the minimum ocean freight rates.

As stated above, Canada's consumption of cement has decreased 33 per cent. During the same period consumption in the United States has increased 40 per cent. To-day the consumption of cement in Canada is approximately three-quarters of a barrel per head, and in the United States it is one barrel per head of population.

I have faith that the Canadian people can and will solve the present and future problems, but most of the solutions will of necessity take time. I therefore do not look for anything approaching a boom or even maximum business, in 1923, but do expect a steady and healthy improvement.—From "Municipal Improvements."

How Should Exterior Surfaces Be Treated?

Recommended Practice for Giving a Good Appearance to Concrete Industrial Buildings—An American Concrete Institute Specification that Gives Practical Ideas for Finishing Walls

At the recent annual meeting of the American Concrete Institute, Committee C-3 on treatment of Concrete Surfaces presented a "recommended practice for treatment of exterior surfaces of industrial reinforced concrete buildings." The report which was adopted as a tentative standard is as follows:

I.—SCOPE AND GENERAL REQUIREMENTS

1. This recommended practice is designed to outline approved methods of treating the surfaces of concrete factories, warehouses, and other industrial buildings, in such manner as to produce pleasing and durable surfaces at costs which are not inconsistent with the occupancy and surroundings of such buildings.

2. Good exterior appearance of concrete buildings depends fundamentally on care in the building of forms for the outside beams and columns. Boards used in column forms should always run vertically, and in beams horizontally, and should preferably be of even width in order that the board marks be continuous throughout the length of the column or beam. Sound, clean lumber of sufficient strength should be used and the forms properly braced in order to preserve the straightness and trueness of the general lines. The concrete should be carefully proportioned, mixed, and placed in order to reduce to a minimum the need for pointing, patching and other corrective treatments.

Note:—Industrial buildings, as a rule, are located in districts where appearance is a matter of secondary importance. The cost of any surface treatment, is therefore, of prime importance, and circumstances are usually the governing factor in the selection of the type of finish. It is a fact, however, that a reasonable expenditure is justified in making the exterior of a building attractive to the public as an advertising feature, if for no other reason. Under any consideration all concrete structures should at least have all voids pointed, and exposed wires, nails and bolts removed or cut off so as to guard against disintegration from the action of the elements. From this required minimum one may go to the costly extremes of inlaid tiles or brick and stone veneers, but such treatments are to be considered from the architectural view point, and are beyond the scope of this practice, which is limited to the treatment of the concrete itself as it comes from the forms. Due to the very nature of concrete, the forms are subject to a certain amount of movement while being filled, no matter how careful the supervision or workmanship. No amount of work will correct the faulty appearance of a building unless the general lines are good, and it is, therefore, essential to guard in so far as possible against bulging and distortion of forms. It is also obvious that care in concreting will eliminate unnecessary expense in finishing, and at the same time give better results. A reasonable amount of precaution to prevent the occurrence of conspicuous defects is better than the cure of such defects afterwards.

II.—CLASSIFICATION OF SURFACE TREATMENTS

3. The surface treatments described herein are divided into the following five general classes:

a. Pointing and patching (minimum requirements).

b. Correction of column and beam lines, fill joints, etc.

c. Cement washes and proprietary paints.

d. Rubbed finishes.

e. Tooled finishes.

The recommended methods for producing these finishes are given in detail in the following sections:

A. Pointing and Patching (Minimum Requirements)

4. All nails, wires, and bolts should first be removed or cut back to a depth of at least one in. from the surface of the concrete, to prodvide sufficient key for the pointing mortar, and to insure against water reaching any pieces of iron or steel and causing rust spots or spalling.

5. Bolt holes should be filled with corks of ⅛ in. greater diameter than the holes. The corks should be driven into the holes until the head is one in. back from the surface.

6. Before pointing, all defective places should be thoroughly cleaned of dust, loose pieces, laitance and foreign particles (such as saw dust). The spot to be patched and the concrete immediately around it should then be saturated with water. A mortar of one part cement and two parts of clean building sand should then be forced into all parts of the cavity or defective spot, and the surface rubbed with a cork or wood float. Any mortar that may work out and lap over on the sound concrete should be removed with a clean dry brush or a piece of bagging.

7. If large patches of considerable depth and area occur, the mortar should be applied in two or more coats. Each undercoat should be scored as in plaster work, but it is not necessary or desirable for each coat to become entirely dry before applying the next.

8. Patching should be avoided in hot sunshine or quick drying wind, unless it is feasible to protect the fresh mortar with wet burlap or canvas.

Note:—The pointing and patching treatment outlined above naturally leaves a somewhat spotty appearance, but after weathering for several months the entire surface will begin to assume a fairly uniform color. A pointed place will usually show up as a dark spot on the body of the building unless the mortar used is somewhat lighter in color than the mortar used in the concrete. This can be corrected by using a little white cement or a light colored sand in the pointing mortar. It has become quite common practice to use white beach sand, but the Committee would recommend a bank or dredged sand which has been screened through a No. 10 sieve. Final rubbing of patches should be parallel to board marks of surrounding area so as to make patch as inconspicuous as possible.

It is to be noted that the treatment prescribed in this section is that which is warranted entirely from the standpoint of utility, rather than from that of appearance.

B. Correction of Column and Beam Lines, Fill Joints, Etc.

9. This section is supplementary to Section A and prescribes additional corrective treatment, but not to the extent of eliminating board marks or bringing the surface to uniform color.

10. The building should first receive the pointing and patching treatment where required, as described in paragraphs 4 to 8 inclusive.

11. Workmen should be instructed to watch for steel reinforcement near the surface, and if this condition should be found special precautions should be taken to protect such steel from rust.

Note:—When reinforcing steel in exterior members is not back at least one full in. from the outside face of the concrete, moisture works its way in causing it to rust. Eventually this rusting if continued will spall off the concrete and cause an unsightly appearance and may even in severe cases affect the strength of the structure. Good design should never call for such sizes of hoops, spirals, stirrups, etc., as will necessitate steel within one in. of the surface, but sometimes due to careless placing the steel will be at or near the surface.

To correct this condition cut out the concrete around the steel on all sides and if the bar is of minor importance cut it off well back from the surface. When it is not advisable to cut out the steel the recess should be cut large enough so as to bend the steel back from the surface.

If important and large bars should be encountered where it is not desirable or feasible to either bend back or cut off the steel the bar should be painted with red lead and then wrapped loosely with No. 16 iron wire to insure a bond and the recess carefully pointed.

12. Beams with sag or bulge, and columns which are out of plumb should be cut to line.

13. Nail head marks, fins and other small projections should be removed.

Note:—It has been found that pounding with a flat headed hammer will cause the projection to crumble down to the general level of the surrounding surface. This method gives better, quicker and cheaper results than cutting with a chisel, which may have to be used on projections of considerable size.

14. Fill lines should be dressed by thoroughly cleaning the joint and then applying mortar and finishing with cork or wood float, as described in paragraph 6.

Note:—Good judgment must be used in deciding how far the more expensive work of truing up bad lines should be carried, as considerable money may easily be spent without materially improving the general appearance.

When cleaning up and pointing around windows and miscellaneous iron particular care should be taken to cut clean sharp edges, and not allow a film of mortar to lap over the steel, for this film will in time break away and leave a ragged edge, and may, in the case of windows, cause a leak.

If a prominent board mark has been erased by the pointing, the patch will not be so noticeable in contrast to the body of the building if the mark is ruled in again.

It is estimated that the treatment prescribed in sections A and B will require about one and one-half bags of cement per 1,000 sq. ft. of surface. The cost will average between 2 and 3 cents per sq. ft. with cement masons at 75 cents per hour and labor at 40 cents per hour. The actual cost in specific cases may vary considerably from this estimate, according to the quality of the form work and the concreting.

C. Cement Washes and Proprietary Paints

(a) Cement Washes

15. Cement washes of practically any color from white or cream to cement gray can be prepared by varying the proportions used of white or gray cement and light or dark sand. A mixture of 1 part white cement and 1 part finely screened yellow bank sand, with 5 per cent of hydrated lime (by volume of cement) will give a serviceable color just off the white, and will serve as an example of a typical dry mixture.

16. After the cement, sand and lime in the desired proportions are thoroughly mixed in the dry state, the mixture should be added slowly to water, stirring vigorously until the consistency is that of a stiff oil paint. The dry batch should be large enough for a full day's work, but only enough of the wash should be prepared to last one hour. The wash should be fully stirred in the container before each application to the concrete surface, and when refilling the container all the old wash should be cleaned out and discarded.

17. Before applying the wash, all pointing and patching should be completed as indicated in Sections A and B. The area to be coated should first be thoroughly wet, and then a full brush coat of the wash applied. This coat should be rubbed in with a cork float, the surface being sprinkled with a little additional water if necessary. Finally the surface should be gone over with a clean damp brush, brushing in the direction of the board marks. In this process all excess material should be removed, and the remaining coat should be as thin as will permit the surface to be entirely covered.

18. In coating adjacent areas the brush marks should be carefully blended to avoid a line between the two areas. The work should be so planned that joinings occur at natural breaks in the surface.

19. In warm or drying weather the finished surface should be sprinkled with water once a day for three days, and in cool, damp weather should be sprinkled at least once within 24 hours after finishing.

Note:—The sand must be dry before screening not only to facilitate the screening but also to avoid the possibility of moisture in the sand causing a set in the dry mix. Best results seem to be obtained with a No. 18 sieve.

Whenever a cement wash is to be used, less attention need be given to the color and finish of patches as described in the note under Section A, since it is apparent that the applied coating will give the desired uniformity to the concrete surface. This coating should, however, be as thin as possible, for a thick coat will eventually craze and peel off.

A very fine appearance is obtained if the wash is rubbed in with a carborundum stone. This not only insures a better bond, by more positively forcing the material into the pores of the concrete, but at the same time grinds down any slight projection, leaving a semi-rubbed surface.

Sprinkling of the freshly coated surface is necessary, for if the wash dries before it has attained its set, it will dust off. A very practical way to sprinkle the surface is to make up two perforated pieces of pipe about four feet long, on a "T" and plug the ends. Then connect a hose to the leg of the "T" and lower the pipe down from the roof over the face of the columns and walls. Spray nozzles can also be used to advantage. The sprinkling must be gentle so as not to wash off the fresh coating.

The Committee has been informed that a very effective way of insuring the bond of the wash coat is to use a 4 per cent solution of commercial calcium chloride as the gaging liquid instead of plain water. This solution is made up by dissolving one lb. of the chloride in three gallons of water. The calcium chloride attracts moisture from the air and keeps the wash coat damp for several days, thus insuring that the cement sets before it dries out.

The cement wash will cost about 2 cents per sq. ft., and will require about one bag of cement per 1000 sq. ft. Adding the cost of the work specified under Sections A and B the total cost of this method of surface treatment would be about 5 cents per sq. ft. with cement masons at 75c per hour, and labor at 40c per hour, and the total material one and one-half bags of gray cement and one bag of white cement per 1000 sq. ft.

(b) Cement Paints

20. Whenever proprietary cement paints or coatings are to be used, the manufacturer's directions should be followed in their application.

Note:—The Committee recognizes that there are many paints and coatings for concrete on the market which have been widely used, and have given satisfaction. It cannot, however, give its endorsement to particular proprietary materials, owing to its own limited facilities for conducting the exposure tests and field inspections on which ratings should be based.

D. Rubbed Finishes

21. The rubbed finishes are obtained with carborundum stones. The first rub should be completed as soon as the forms can be removed. Faces and sides of columns should be stripped in 24 hours, if possible, and the soffits of beams should be treated within three or four days.

22. As soon as the forms are removed the surface should be thoroughly wetted and then rubbed with a No. 20 carborundum stone. The rubbing will remove fins, board marks, nailhead marks, and to a certain extent the irregularities between boards.

23. The cement paste which works up in the rubbing process should be removed by washing and brushing. Small voids in the concrete should be filled with a mortar (usually 1:2) composed of finely screened aggregate of the same general description as that used in the concrete. This mortar should be worked into the face with the carborundum stone and left even and regular.

Note:—The best and most economical results are obtained by applying the first rub to the concrete while it is "green." Filling of the small voids with mortar as described in paragraph 23 offers no difficulties, but the operator should be warned against leaving an appreciable thickness of mortar on the face of the concrete to take up irregularities in the surface, unless special precautions are taken to insure the bond. Such precautions are particularly necessary when the surfacing is delayed until the concrete has hardened and dried out.

24. If the concrete cannot be given the first rub when it is still "green," board marks, nailhead marks, and small projections must first be removed as indicated in paragraph 13. After thorough wetting, the surface should receive the cement wash application as described in the first part of paragraph 17, in order to help the grinding action. (See also the second paragraph in the note following paragraph 19). The carborundum rub should be given as prescribed above, being sure to remove all the cement wash by washing and brushing.

25. The second rub should be applied near the end of the work, when the building is ready to clean down and danger of staining from other work is past. The surface should be thoroughly wet and then gone over with a No. 24 carborundum stone. The paste which is worked up should be removed with a wet brush or clean bagging. When dry the finished surface will resemble limestone in color and texture.

Note:—When using the rubbing method described in this section it is essential that all patching, correction of lines, etc., be done before or during the first rub. When the second rub is performed nothing but the stone and plenty of water should be used. The irregularities of color or texture which are noticeable after the first rub need not be considered as the second rub brings the surface to an almost uniform color.

The cost of this process including miscellaneous pointing and first and second rub should cost about six cents per sq. ft. with masons at 75c per hour and labor at 40c per hour.

E. Tooled Finishes

26. As here used, tooled finishes include all finishes in which the surface of the concrete is mechanically roughened, or removed to expose the aggregate. Wire brushes, stone dressing tools, and rotary cutters are used for this purpose.

27. When coarse aggregate is to be exposed by wire brushing, the concrete should be as green as possible, usually not over 48 hours old. Generally speaking, this process is not practicable on large buildings, unless special effects are to be obtained, in which case the treatment, if it is to be successful, requires careful preparation and selection of aggregates, as well as extreme care in concreting.

28. When bush hammering, crandalling or other tooling treatment is to be used, considerable thought should be given to the proper layout of construction joints and fill lines, and plans showing the treated areas should be issued before any concrete is placed. The work should be planned to eliminate as many joints as possible, particularly horizontal fill lines. If the latter are unavoidable they should be absolutely level.

29. Where coarse aggregate is to be exposed by picking or hammering, it should be of uniform size or uniformly graded. The distribution of the aggregate should be uniform for satisfactory results, and the consistency of the mix should, therefore, be care-

fully controlled in order to prevent the settling or segregation of aggregate.

30. When patching or filling of bolt holes is required on an area which is to receive a tooled finish, the tooling should precede the patching. The latter should then be done by a skilled workman who should match the texture of the surrounding area by imbedding selected pieces of large aggregate in a mortar bed.

31. Surfaces to be finished with a rough texture should be at least two weeks old before finishing. The work may be executed by mechanical devices operated by air or electricity, or by hand hammering. In general the work on any one panel or area should be done by the same operator in order to avoid differences in texture.

32. As the tooled finishes are usually carried out in panel effects, great care should be taken to lay out exact lines and to cut clean and sharp at the edges. The borders of the panels and such other parts of the surfaces as are not roughened must receive the usual pointing as described in Sections A and B, and also one of the wash or rubbed finishes, to balance with the tooled areas.

Note:—In the Committee's opinion the effects that are possible under the various tooling treatments are the most pleasing of any, but at the same time are the most costly and difficult to do. They must also be considered entirely from an aesthetic view point as they do not add to the weather resisting qualities of the concrete, and in fact tend to its disintegration, if the concrete is not of the best.

The success of tooling depends upon uniformity in the results obtained, and, therefore, special attention is called to the importance of avoiding joints, fill lines, laitance and segregation. Careful selection of aggregate helps in attaining the desired uniformity, and if the aggregate be selected for color, its exposure by tooling will introduce effects in color variation, as well as in texture.

Secretary of Montreal Builders' Exchange

Major H. Lefebvre, M. C., has been appointed secretary of the Montreal Builders' Exchange, succeeding Mr. David K. Trotter, who had occupied that position for the past seven years.

The store of Louis Gendron, sanitary and heating engineer and contractor, Hull, P.Q.

Not One Failure in Fifteen Years

The Burlington Steel Company state that one of their customers, a railway equipment company, has used over three million pieces of rail carbon steel, during the past fifteen years in the manufacture of rolling stock. These pieces have been in the form of U's or channels, to form brake-beams and in all these years there has not been a single failure.

McDermid Bros. Ltd. Change Location

McDermid Bros. Limited, dealers in roofers' and tinsmiths' supplies, who for a number of years have been located at Jarvis and Adelaide Sts., Toronto, are moving about the first of April to larger and more centrally located premises at Yonge St., and Birch Ave., at the C.P.R. station.

Trade Publications

Milburn Welding and Cutting Apparatus—The Alexander Milburn Company, 1416-1428 W. Baltimore Street, Baltimore, Md., have issued in booklet form a catalogue covering the Milburn line of welding and cutting equipment ranging from the smallest torch to a large compressing plant.

Steel Road Forms—The Heltzel Form and Iron Company, Warren, Ohio, have issued a four page folder illustrating and describing the use of Heltzel "Armor Plate" steel road forms on the "Ideal section of the Lincoln highway." In addition reference is made to Heltzel steel sidewalk forms, steel curb forms and the "Lightning Loader."

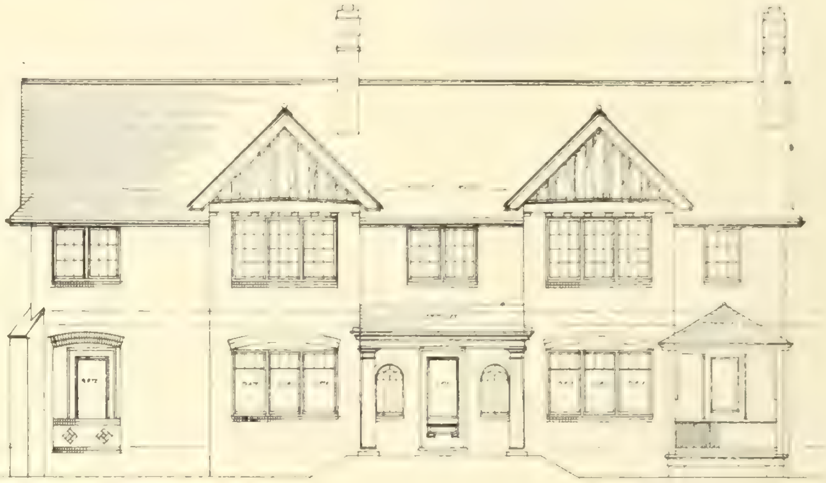
The New Buckeye Backfiller, Model D—This is the title of a 16 page booklet which pictorially describes a new backfiller manufactured by the Buckeye Traction Ditcher Company, Findlay, Ohio. In this machine all operations including steering are performed by power. Levers are banked within easy reach of the operator, making it easy and speedy for one-man operation. The machine is of the two wheel type with full length multiplane traction, each wheel being driven separately to facilitate turning. Full specifications are given in the booklet.

Buckeye Model C. Excavators—This 8 page booklet, issued by the Buckeye Traction Ditcher Company, Findlay, Ohio, is devoted principally to performance data on this type of excavator, the centre two pages showing the machine in all kinds of service. A description of the machine is given, with emphasis on special features such as the rotary auxiliary cutter, quick shift conveyor, and alligator traction.

Results on Road Jobs—The Barber-Greene Company, Aurora, Ill., have issued the 1923 edition of their publication bearing this name. In its 32 well illustrated pages it depicts and describes the use of Barber-Greene equipment—loaders and conveyors—on typical road jobs throughout Canada and the United States. Diagrams indicate the layout in each case while the text describes the plant and method adopted and emphasizes the time, labor and cost-saving features of the mechanicel devices. A list of users of Barber-Greene equipment is appended to the booklet.

The Contract Record's

Weekly House Suggestion No. 62



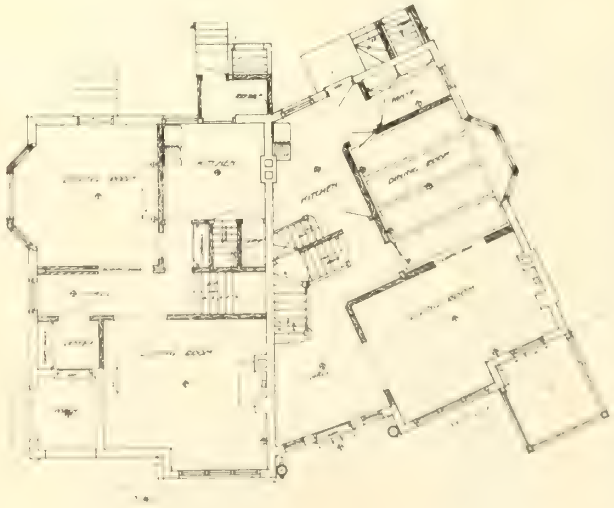
We are presenting this week a problem in house designing which is particularly interesting by reason of the unusual arrangement necessary to conform to the odd-shaped lot on which these houses are constructed. The lot, which is situated on a crescent, runs back to a point at the rear and a great deal of ingenuity had to be employed by the designer in laying out the plans to secure the best results possible from the viewpoints of appearance and convenience.

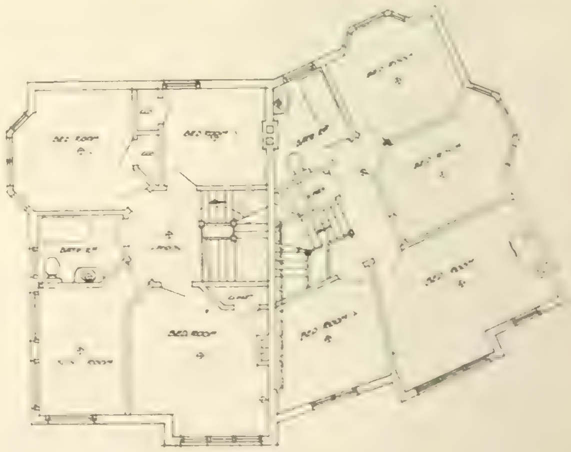
These problems of layout were all confined to the residence at the right, on the bend of the street. The architect has achieved splendid results, however, with the peculiarly shaped space at his disposal. The principal rooms on both floors are large, bright, square rooms, carefully worked into the layout, the space of lesser importance on each floor, such as the kitchen and hallway on the ground floor and the bathroom and storeroom on the bedroom floor, assuming the irregular lines necessary to balance the design. No space is wasted and all rooms are conveniently placed in relation to one another.

The residence to the left presented no unusual problems of layout. It has a cross hall, large bright rooms and the usual built-in features of the modern residence.

The construction of the two residences is brick, with shingle roofing and the interior trim is in hardwood, with quarter-cut oak floors.

Mr. W. H. Siddall, Confederation Life Bldg., Toronto, is the designer of these houses.





Mainly Constructional

East and West—From Coast to Coast

The town of Englehart, Ont., is contemplating the installation of a compressed air system for their deep wells, replacing the present pumping system.

The maintenance of the Toronto Transportation Commission's buildings, which has hitherto been under the direction of Mr. W. McRae's department, has been transferred to Major W. E. P. Duncan's building department.

The Howard Furnace Company, 881 Yonge Street, Toronto, are building an additional two storey solid brick building, steel structure, 75" by 75", to their present factory.

The Lachine canal was emptied recently for the purpose of making any necessary repairs in preparation for the opening of navigation. The canal will be empty for a month.

The work of construction planned for 1923 on the Toronto and York good roads system involves the expenditure of $500,000. A sum which will be borne by the city to the extent of 30 per cent., by the county, 30 per cent., and the province 60 per cent.

Mr. John W. Bowser, of Toronto, has secured contract "A," comprising the greater part of the work of the new sand filtration plant and waterworks extension at Whitby, Ont. The sum agreed on is $22,000. Operations will begin shortly on the lake front opposite the pumping station.

The plant of the Canada Crushed Stone Company, at Dundas, Ont., re-opened recently after a shutdown for the greater part of the winter. The company took advantage of the shutdown to overhaul their machinery, in preparation for a contemplated busy season in road building.

A recent report states that the National Cement Company, a new organization with a capitalization of $4,000,000, at Montreal, have purchased a site and will commence operations on the erection of their plant in May of this year. The chief engineer of the new company is Mr. Louis Hurtibise, Room 300, 90 St. James St.

Mr. George Gander, secretary of the Toronto Builders' Exchange & Construction Industries, stated recently that there are an increasing number of applications being received at the Exchange from boys wishing to apprentice themselves to contractors to learn bricklaying, carpentry, etc., and many of these boys have been placed.

The huge steel framework of the Port Credit Brick Company's new building, on the Lake Shore Road at Port Credit, Ont., collapsed in a strong windstorm recently. Fortunately, the collapse took place at a time when the workmen were employed at another point of the work and no fatalities resulted. The value of the structure was estimated at $50,000.

The council of York Township, Ont., have accepted the design submitted by Mr. F. B. Engholm, of Toronto, for a new bridge over the Rosedale Ravine, at Ashley Ave. The design calls for a structure of the cantilever type, of concrete construction. Mr. Engholm's design was accepted by the council from several submitted, on the advice of Prof. C. R. Young who acted as advisor to the council in this matter.

There is a report from Hamilton to the effect that higher labor wages will be paid to employees of the building trades this year and that agreements between the contractors and the men are about completed. The figures settled on for this year's agreements have been withheld, however, pending final settlement. It is predicted that amicable relations will be existent between labor and the contractors in all branches of the industry at this point this year.

The construction of the proposed additions to Albert College, at Belleville, Ont., will be started this year, several contracts having already been let, including the following: contract for erecting walls and roofing and glazing to the Dickie Construction Company, of Toronto, for $180,000, and contract for copestones to the Peerless Construction Company, of Toronto, for $44,000. The buildings to be erected this year are: administration building, assembly hall, dining room, kitchen, servants' quarters and one residence. It is thought that all exterior work will be completed this year.

A committee of the city council at St. Thomas, Ont., recently appointed a building committee to look after the establishment of the new memorial hospital there. This new building will be a fireproof structure, of steel, brick and concrete, and will cost, it is estimated, about $135,000. Of this sum, $100,000 will be available from the city and the balance will be raised by the establishing of several memorial rooms, which will be paid for by various local societies or individuals. As soon as this balance is in sight, tenders will be called.

Loans totalling $8,283,040 which have resulted in the erection of 2,316 houses are specified in the report of the Ontario housing scheme which J. A. Ellis, director of the bureau of municipal affairs, has made to the government. The Dominion Government is declared to have advanced Ontario the sum of $8,750,000, some $500,000 of which still remains to be advanced to borrowers. Future plans for housing contemplate advances under the terms of the Act to Haileybury, Charlton, and the Township of Bucke in the burned region of Northern Ontario, and for these purposes an additional $500,000 will be borrowed from the Dominion Government.

Personal

Mr. H. Rindal, district engineer for the C.P.R. in British Columbia, has been transferred to Calgary. Mr. F. W. Alexander, district engineer of the Calgary division, going to British Columbia to take over Mr. Rindal's position.

Mr. J. B. Carswell, head of the well known engineering and contracting company, the Carswell Construction Company, of Toronto, has severed his connections with the Toronto Transportation Commission, where he occupied the position of consulting engineer during the period of the commission's rehabilitation work.

Mr. T. M. Jones has severed his connection with the Northern Foundry & Machine Company, with whom he had been associated for thirteen years, to accept a position on the sales staff of Messrs. Mather & Platt, pump manufacturers of Manchester, Eng. Mr. C. H. Timm, A.M.E.I.C., formerly connected with the Dominion Engineering Company, will succeed Mr. Jones as sales manager and chief engineer of the Northern Foundry & Machine Company, with headquarters at Sault Ste. Marie.

A farewell supper was tendered Mr. R. F. Armstrong on the occasion of his retirement from the position of town manager of Woodstock, N.B., by the local Board of Trade, at the Carlisle Hotel, and he was presented with a beautiful club bag as a mark of appreciation for his efforts on the town's behalf during his four-year term of office. Mr. Armstrong is being succeeded by Mr. M. J. Rutledge, of Montreal, who was a guest at the supper. Mr. Armstrong has accepted an appointment with the Citizen's Research Institute, and will be located at Toronto.

Obituary

Mr. L. Roch Montbriand, well-known Montreal architect, died recently at his residence, 658 St. Hubert street, after a long illness. Mr. Montbriand, who was 63 years old, specialized on churches and public buildings, designing several of Montreal's fine structures.

CONSTRUCTIONAL ACTIVITY

Period of March 21 to March 27, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Albanel, Que.
Gravel road, 1½ miles long with concrete and iron culverts, contemplated by the Council. E. Ouellet, secretary.

Coteau Station, Que.
Council proposes to build a reservoir costing $3,000. V. A. Lapalme, secretary.

Dorchester, N. B.
The Dominion Government has plans drawn for sewerage disposal plant for the penitentiary which will cost $25,000. Watermains and sewers costing $10,000 are also provided for in this year's estimates.

East Luther Twp., Ont.
Improvements to road being considered by Twp. Council. U. W. Christie, Grand Valley, engineer.

East Missouri Twp., Ont.
Township Council will lay about two miles of tile. F. Ure & Son, Woodstock, Ont., engineers.

Ellice Twp., Ont.
Township Council will spend $17,000 on drain. John Rogers, O. L. S., Mitchell, engineer.

Englehart, Ont.
Extensions to sewers and watermains at a cost of $9,000 are planned and tenders may be called in June. J. Patterson, clerk.

Flos Twp., Ont.
Drainage work costing $12,000 may be undertaken by the township. C. S. Burton, Elmvale, clerk.

Hamilton, Ont.
New filtering basin and chlorinating plant contemplated by the city. E. R. Gray, engineer and S. H. Kent, clerk.

Concrete sidewalks contemplated by the city for two streets. E. R. Gray, engineer.

Kirkland Lake, Ont.
Tenders will be called about May 1 for sewers and waterworks for Kirkland Lake and Swastika to cost about $60,000.

Les Cedres, Que.
Town Council propose a road costing $20,000. Lionel Bisonnette, secretary.

Minto Twp., Ont.
Tenders will probably be called in May for drains costing $10,000. W. D. McLellan, Harriston, Ont., clerk.

Montreal, Que.
City contemplates sewers. S. Fortin, engineer.

Pasbebiac, Que.
This spring the Town Council will spend $4,000 on road work. C. LeGallais, secretary.

Port Dover, Ont.
Plans are prepared for macadam roadway costing $20,000. Guy Marston, Simcoe, Ont., engineer.

Rigaud Parish, Que.
The Town Council contemplates four miles of road costing $20,000. Nelson Brule, secretary.

St. Aubert, Que.
Gravelling six miles of roadway will cost the Town Council $12,000. A. Dube, secretary.

St. Bonaventure, Que.
Town Council will commence gravelling a road this spring. L. Joyal, secretary.

St. Dennis, Que.
Town Council will lay a macadam road this spring costing $7,000. E. Chaput, secretary.

St. Joseph, Que.
Provincial Government may lay pavement costing $3,000. A. L'Heureu, secretary.

St. Maxime de Scott, Que.
Road improvements costing $1,000 are proposed by the Town Council. Geo. Dunn, secretary.

St. Sylvestre, Que.
The Town Council is considering gravelling a roadway at a cost of $6,000. J. A. Payeur, secretary.

Sherbrooke, Que.
Trunk sewer, costing $15,000 contemplated by the city. T. Tremblay, engineer.

Waterworks contemplated by the council will cost $20,000. T. Tremblay, engineer. Tenders will be called on cast iron pipe, gate valves, and service pipe including lead and galvanized iron.

Paving program contemplated by the Council will involve an expenditure of $125,000. Funds are available and work is expected to start about the end of April. T. Tremblay, engineer.

Tiny Twp., Ont.
Drainage work, costing $20,000 contemplated by the Township Council. A. Belcourt, Perkinsfield, clerk.

Warwick Twp., Ont.
Plans are being prepared for the Township council for a drain. Tenders will be called about May 15. G. A. McCubbin, 135 King St., Chatham, engineer.

York Co., Ont.
Tenders for the following roadwork being received by the Toronto & York Roads Commission until Apr. 6: 1—waterbound macadam; 2—bituminous macadam; 3—hot mixed paving; 4—stone; 5—oil and tar. E. A. James, engineer, 57 Adelaide St. E., Toronto.

F. G. Engholm, 16 Gloucester St., Toronto, has been appointed by the Township Council engineer for the $90,000 concrete arch bridge. Tenders will be called about Apr. 15.

CONTRACTS AWARDED

Ellice Twp., Ont.
Twp. Council has awarded the general contract for improvements to a drain to Jas. McDonnell, R. R. 2, Gadshill, Ont., at $24,566.

Hullet Twp., Ont.
W. A. Stevenson, Brussels, is building a drain for the Township Council.

Marieville, Que.
The general contract for concrete roadway, Montreal-Sherbrooke route, awarded by the Provincial Government to Kennedy Construction Co., 310 Shaughnessy Bldg., Montreal, at $35,211.

Montreal, Que.
Contracts for 6,000 tons of cast iron pipe and special castings awarded to Canada Iron Foundries Ltd., Mark Fisher Bldg., Montreal, at $32.43 per ton.

Ottawa, Ont.
Ottawa Suburban Roads Commission has awarded the general contract for bituminous road material to Imperial Oil Ltd., 310 Percy St.

Railroads, Bridges and Wharves

Bridgeburg, Ont.
New York Central Lines plan a bridge over Niagara River. G. W. Rittredge, c/o owner, engineer.

Bucklaw, N. S.
North Atlantic Salt & Chemical Co. Ltd., G. B. Wilcox, 900 Warren St., Chief Engineer, planning a wharf and will call tenders about the middle of April.

Canso, N. S.
Tenders will be called shortly for a wharf costing $7,700 for the Dominion Government.

Contrecoeur, Que.
Quebec & Southern R. R., Sorel, contemplates a station. Work will commence this spring. S. Greehan, Sorel, buyer.

Devil's Island, N. S.
$9,000 is allowed in the estimates for 1923 for repairs to the breakwater at Devil's Island. R. C. Desrochers, secretary.

Fort Hood, N. S.
Repairs to be made to the wharf by the Dominion Government this year will cost about $8,600.

Friar's Head, N. S.
Extensions and repairs to the break-

water at a cost of $4,200 contemplated by the Dominion Government.

Grande Riviere, Que.
Tenders will probably be called shortly for a metallic bridge costing $35,000. Jean Vallee, Dept. Public Works, Quebec, engineer.

Greenock Twp., Ont.
Bruce County Council wants tenders on a steel and concrete bridge 112 feet long. G. E. Stephenson, Walkerton, engineer.

Half Island Cove, N. S.
Included in 1923 estimates is the rebuilding of the breakwater at cost of $4,350. R. C. Desrochers, Parliament Bldgs., Ottawa, secretary.

La Visitation, Que.
Town Council considering the building this summer of a reinforced concrete bridge. Hiliare Boivert, secretary.

L'Islet, Que.
Contemplated improvements to a wharf owned by the Provincial Government will cost about $24,000. A. G. Sabourin, District engineer. Work is expected to proceed this spring.

Lockeport, N. S.
Dominion Government may build a wharf costing $5,000. R. C. Desrochers, secretary.

North River, N. S.
Repairs to the extent of $3,000 will be made to the wharf owned by the Dominion Government. R. C. Desrochers, Ottawa, secretary.

Ostrea Lake, N. S.
Dominion Government will repair a wharf at a cost of $2,700. R. C. Desrochers, Ottawa, secretary.

Pasbebiac, Que.
Provincial Government may build a bridge this spring. I. E. Vallee, Parliament Bldgs., Quebec, engineer.

Port Greville, N. S.
Dominion Government has included in 1923 estimates repairs to the breakwater, at a cost of $3,000. R. C. Desrochers, Ottawa, secretary.

Port La Tour, N. S.
Reconstruction of a breakwater contemplated by the Dominion Government at a cost of $6,800.

Port Stanley, Ont.
Repairs to the harbour and docks, costing $5,000, contemplated by the Dominion Government and the item is included in 1923 estimates.

Pugwash, N. S.
Dominion Government proposes to repair the wharf at a cost of $4,500 and has included this item in this year's estimates.

Red Island, N. S.
Dominion Government has allowed $5,250 in this year's estimates for repairs to the breakwater.

St. Aubert, Que.
Town Council plans to build a small bridge. A. Dube, secretary.

St. Bonaventure, Que.
$6,000 concrete bridge contemplated by Town Council. Leo. Joyal, secretary.

Sherbrooke, Que.
City Council is awaiting a decision from the Railway Commission before commencing to widen a viaduct at a cost of $25,000. This work will probably be commenced in April.

Stamford Twp., Ont.
Hydro Electric Power Commission of Ontario and the Township Council contemplate building a bridge. T. R. Stokes, Portage Rd., Niagara Falls, Twp. Clerk.

Stoney Creek, Ont.
The Suburban Area Commission is considering the erection of a concrete bridge. Mr. Vance, Court House, Hamilton, engineer.

Sydney Mines, N. S.
Dominion Government will call tenders shortly for repairs to a wharf at a cost of $3,300.

Vaughan Twp., Ont.
Frank Barber & Associates, Jarvis St., Toronto, are receiving tenders until Mar. 31 for a reinforced concrete bridge to be built on the Langstaff side road.

Walkerville, Ont.
Improvements to the street railway system contemplated by Ontario Hydro Electric System. Mr. Gaby, Chief Engineer.

West L'Ardoise, N. S.
Tenders will be called for soon by the Dominion Government for an extension to a breakwater costing $7,500.

Wotton, Que.
New tenders for a concrete and iron bridge are being received by T. Gervais, Wottonville, secretary.

CONTRACTS AWARDED

Kingston Parish, N. B.
General contract for a bridge awarded to Harold J. Gibbons, Bayswater, by the Provincial Government at $1,400.

Three Rivers, Que.
The general contract for an extension to the lines of the Three Rivers Traction Co. was awarded to St. Maurice Construction Co. Ltd., Shawinigan Falls. Cost will be about $100,000.

Public Buildings, Churches and Schools

Arnprior, Ont.
Plans are being prepared by J. A. Ewart, Jackson Bldg., Ottawa, for a High School. M. Graham, secretary.

Brantford, Ont.
Tenders are being received until Mar. 31 by A. K. Bunnell, secretary of the Board of Education for a two storey school costing $45,000.

Bridgeburg, Ont.
Plans are being prepared for a temple for the International Lodge No. 278, Oddfellows. Judge M. House, chairman of the building committee.

Cornwall, Ont.
R. C. School Board may erect a school in the east end of the town. The architect has not been appointed. Father McDonald, interested.

Board contemplates a school in the west end and has not yet appointed an architect. C. H. Smith, chairman.

Millson, Burgess & Hazelgrove, 185 Sparks St., Ottawa, are preparing plans for an addition to the High School which will cost $100,000.

Dorchester, N. B.
Additional buildings for officers quarters at Dorchester Penitentiary are planned by the Dominion Government at a cost of $10,000.

Completion of the penitentiary hospital at a cost of $20,000 included in the 1923 estimates, also a deputy warden's residence costing $10,000.

Englehart, Ont.
Tenders for the balance of the work on the Town Hall and Fire Hall will be called in May. Architect, P. H. Joanisse, Cobalt, Ont.

Ford, Ont.
Plans prepared for the Public School Board for an addition to Edith Cavell School. J. Dower, Box 274, secretary.

Grosse Isle, Que.
R. Wright, Hunter Bldg., Ottawa, chief architect, has prepared plans for repairs to the Quarantine Station. Cost will be about $5,500.

Hamilton, Ont.
Offices in the basement of the City Hall will be remodeled. Mayor Jutten, interested.

Bulk and separate tenders for a $100,000 church being received by A. W. Holmes, architect, 79 St. Joseph St., Toronto, until Apr. 3.

Hanover, Ont.
W. G. Murray, Dominion Savings Bldg., London is preparing plans for a $60,000 school for the High School Board. Wm. Ruttle, secretary.

Plans are being prepared for the Separate School Board for a $30,000 building. W. G. Murray, Dominion Savings Bldg., architect.

Hurdman's Bridge, Ont.
Tenders received for $20,000 school until Mar. 31. H. D. Price, secretary of the School Board.

London, Ont.
Tenders will be called about Apr. 1 for a gymnasium for Askin Methodist Church. W. Hawkin, 422 Picadilly St., architect.

Milverton, Ont.
Tenders for the addition to the High School are being received until April 16 by W. J. Spence, secretary.

Moncton, N. B.
Post Office contemplated by the Dominion Government, R. C. Desrochers, Ottawa, secretary.

Montreal, Que.
Tenders will be called about Apr. 15 for City Hall. R. Bauset, clerk. Louis Parent, architect.

Ottawa, Ont.
J. Albert Ewart, Jackson Bldg., is preparing plans for a large addition to Asbury College. Tenders will be called in May.

Ste. Anne de Beaupre, Que.
Plans for the monastery are being prepared by L. N. Audet, 70 King St.,

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

Tenders Wanted

Tenders will be received by the undersigned until

Monday, April 16th, 1923,

for the erection of a four roomed School Building in the Town of Milverton, Perth County.

Plans and specifications may be seen at Wm. Smith's Shop, Main Street.

W. J. SPENCER,
Sec-Treas. School Board.
12-14

TENDERS

Tenders will be received for the erection of a Manse, up till **April 2nd**, by W. J. B. Davidson, Secretary for the Presbyterian Manse Committee, Port Hope, Ontario.

Tenders to be separate or in bulk, but no tender necessarily accepted.

Plans may be seen at the office of the Secretary, or at the offices of

ELLIS, ELLIS & RICHARDSON,
Architects,
12-13 Manning Chambers, Toronto.

TENDERS

Sealed tenders, separate or bulk, plainly marked as to contents and addressed to the Secretary of the School Board will be received up to 5 o'clock, P.M.

Friday, April 6th,

for the erection of a four room School Building at Bronte, Ont.

Plans and specifications, tender forms and all information may be obtained from the Secretary of the Board or at the Office of Smith & Wright, Architects, Dominion Bank Chambers, 2945 Dundas St. W., Toronto on and after Saturday, March 24th.

A deposit of $10.00 is required to assure the return of the plans.

The lowest or any tender not necessarily accepted.

LeROY SARGANT, Secretary,
S.S. No. 13 Trafalgar,
12-13 Bronte, Ont.

Tenders for Parapet Wall

Sealed tenders addressed to the Queen Victoria Niagara Falls Park Commission, at Niagara Falls, Ontario, will be received by the undersigned until 12 o'clock, noon, on **Saturday, April 7th, 1923.**

for

(A) Complete construction of a stone parapet wall on concrete foundation with iron panels, total length 715 feet.
(B) Supplying 3200 cubic feet of prepared stone for parapet wall.
(C) Excavate and Construct concrete foundation, place stone and furnish iron panels for parapet walls.

Specifications and plans may be seen and forms of tenders obtained at the Administration Building, Niagara Falls, Ontario. Each tender must be accompanied by a marked cheque for $500.00, payable to the Park Commissioners.

The lowest or any tender not necessarily accepted.

JOHN H. JACKSON,
13-14 Superintendent.

RATES

20 cents per agate line (14 lines to the inch) Positions Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

TENDERS

Sealed tenders addressed to the Chairman of the Toronto Electric Commissioners will be received until 5 o'clock p.m., **Thursday, April 5th,** for extension to Sub-station on Bay Street, including excavation, masonry, structural steel, etc., roofing, plumbing, painting and such other work required for a completed building.

Tenders must be accompanied by marked cheque. The forms of Tender may be obtained from the Purchasing Agent or the Engineering Department at Station D, where plans and specifications may be consulted and any other information obtained.

The lowest or any tender not necessarily accepted.

THE TORONTO ELECTRIC
COMMISSIONERS 13

Notice to Contractors

Sealed tenders, marked "Tender for Oakville Bridge and Approaches," will be received by The Toronto and Hamilton Highway Commission, Highway Administration Building, University Ave., Toronto, until 12 o'clock noon on

April 24th, 1923,

for the construction of a Reinforced Concrete Bridge over the Sixteen Mile Creek at Oakville, and for grading the approaches thereto.

Alternative tenders, based upon a design to be prepared by the contractor for a reinforced concrete or a steel bridge and the approaches thereto, will also be received up to the same time.

Plans, specifications and other information may be obtained at the office of the Commission.

The lowest or any tender not necessarily accepted.

THE TORONTO AND HAMILTON
HIGHWAY COMMISSION,
S. A. Cummiford,
Secretary.
Toronto, March 24, 1923. 13

FOR SALE

Contractor's Plant

Stored in Eastern Ontario on Railroad Siding

One Doty 6 x 9 Hosting Engine Double Cylinder, double friction drums, Swinger and Boiler.

1/3 yd., Smith Mixer with 5 x 5 Vertical Steam Engine.

One Vertical Boiler 36 x 100 W.P. 125 lbs.

One Locomotive Boiler 50 H.P.

One No. 4 Model Keystone Excavator with scoop and skimmer.

Apply Box 192, Contract Record, Toronto. 13-14

For Sale

Two Dump Wagons of 2 yards capacity. Mackenzie, Milne & Co. Ltd., Sarnia, Ont. 13-14

For Sale

A 12 cubic foot capacity Wettlaufer Paver Mixer in good running order, cheap. Paul Bergmann, 128 King St., Waterloo, Ont. 13-14

STEEL PILING

Bought and Sold

Universal Equipment Company
Niagara Falls. 11-T-f.

For Sale

1 Besser tile making machine.
12 Block and Tile Cars.
1 Model A—8 x 8 x 16 Automatic Ideal Block Machine.
600 8 x 8 x 16 Pallets.
1—7½ H.P. 25 Cycle Meter New.

All in A1 condition. H. L. Robidoux, Contractor, Amherstburg, Ont. 13

Some One Wants to Buy

The equipment or machinery that you are not using.

It may be occupying valuable space in your yard or shop, collecting dust, rust and hard knocks.

Sell it before "Depreciation" scraps it.

Use the Tender & For Sale Department. It helps others, let it help you.

FOR SALE

Keystone Excavating Machine, complete with two sticks, skimmer scoop, and three ditching scoops; this machine has been used only one season and is guaranteed to be in first class condition. Price $4,500 f.o.b. St. John, N. B.

Austin Backfiller with caterpillar traction, 4 cylinder Buffalo engine, in equally good condition. Price $2,500 f.o.b. St. John, N. B. Canada Lock Joint Pipe Limited, 65 Pleasant Boulevard, Toronto, Ont.; or St. John, N. B. 6-T.f.

CONSTRUCTION SUPERINTENDENT with 15 years experience handling all classes of building and water work, wants position. A1 testimonial and guarantee results. Will go anywhere. Box 147, Contract Record, Toronto. 12-14

GENERAL CONSTRUCTION SUPERINTENDENT with 25 years experience handling all classes of Buildings. Practical also Registered Professional Civil Engineer, wants position. A1 references. Will go anywhere. Box 175, Contract Record, Toronto. 11-14

FOR SALE

Sturtevant Heating Unit

Steam Coils steel encased 8′ 6″ wide x 7′ 8″ high x 8′ 6″ long. Inlet for Exhaust Steam 10″ dia. Also Inlet for Live Steam 1½′ dia.

The above was used for heating our Bridge Shop which was destroyed by fire, and we accordingly offer it for sale.

PRICE: $1500.00 f.o.b. Cars, New Glasgow.

THIS IS A REAL BARGAIN.

The Maritime Bridge Co., Ltd.
NEW GLASGOW, N.S. 13

A Service to the Profession

Every man wishing to tender must first see the plans and specifications.

If the plans are in Montreal and he is in Vancouver the inspection is a problem. We, however, with your assistance, are able to solve it. Place them on file at any or all of the offices of the "Contract Record" throughout the Dominion.

Contractors, engineers and allied manufacturers read the "Contract Record." It is the logical publicity medium for the announcement of tenders wanted.

Send us your plans. They will receive the best of care.

A room is reserved in each of our offices for examination of your plans by possible bidders.

Contract Record and Engineering Review

Toronto - - - 345 Adelaide St., W.
Montreal - - 119 Board of Trade Bldg.
Winnipeg - - - 302 Travellers' Bdg.
Vancouver - - - 106 Winch Bldg.

Road-Making Foreman Wanted

Foreman wanted in Quebec town about ninety miles from Montreal. Must be able to take entire charge of building asphalt-bound macadam road. A good salary will be paid to competent man. In replying to advertisement, give full particulars of experience. Box 194, Contract Record, Toronto. 13-14

GRADUATE MECHANICAL and electrical engineer. Fourteen years design and construction various industrial plants and equipment. Four years city engineer Canadian city. Two years engineer and manager Public Utilities same city, desires active and financial interest in growing manufacturing or general contracting company. Box 195, Contract Record, Toronto. 13

CONSTRUCTION SUPERINTENDENT, graduate and trained civil engineer, open for position in three weeks' time, with contracting or construction company. Bridges, buildings, railroad work. Experienced office or field. Just successfully completing concrete contract large railroad bridges in North. Box 181 Contract Record, Toronto. 12-13

Late News

Hamilton, Ont.

B. H. Prack, Bay St., Toronto, has been appointed architect for the new Lister Building.

Moncton, N. B.

D. A. McBeath, 932 Main St., contemplates a store costing $20,000.

Montreal, Que.

Tenders will be called about April 15 by Edmond Cote, general manager of the National Cement Co., 90 St. James St., for a cement plant.

Tavistock, Ont.

Tavistock Building & Mfg Co., Hope St. W., recently incorporated with a capital of $30,000 will take over and operate the business of H. W. Kalbfleisch & Sons.

Three Rivers, Que.

Repairs costing $160,000 will be made to a bridge. Steel, lumber, concrete, etc., will be required. Work will commence in June. A. Normand, mayor.

Toronto, Ont.

Neil S. Beggs, 6 Jean St., has prepared plans for a 14 suite apartment house costing $80,000.

Ball Bearings in Giant Crane

A large overhead travelling crane recently constructed in Great Britain for a railway in the Far East contains several interesting features. The crane has a span of forty feet and a lifting capacity of forty tons. It runs on wheels which are fitted with double rows of ball bearings and the axles of the hoisting mechanism are similarly equipped. One result of this refinement is that the crane is very sensitive to the action of the controller, and therefore makes small movements with unusual rapidity and accuracy. The use of ball bearings also diminishes the tractive effort required, and thus saves power. Another advantage is that the bearings will run over a very long period without lubrication.

Rotary Tunnelling Machine

In the various mining operations which played so prominent a part during the war considerable use was made of special machines for driving tunnels. They were chiefly of a comparatively small size, but the experience so gained has encouraged the development of similar principles in cutting large tunnels, up to seven and even twelve feet in diameter. This machine consists essentially of rotary cutters driven by an electric motor, the soil removed by the cutters being deposited on a conveyor at the rear of the machine. The whole equipment is provided with means for forcing the cutter forward so that the lips can bite upon the material to be excavated. The machine is mounted on rails laid on the bottom of the tunnel and is worked forward by a hydraulic ram which is under control so that the speed of advance can be regulated. All the motions of the machine itself are derived from a single electric motor, which in the case of a seven foot tunnel is of only 25 horse power. Working in chalk the seven foot machine travels forward forward three feet per hour—which is equal to 116 cubic feet of excavation. In hard marl the twelve foot machine will go as fast as eight feet per hour under favorable conditions.

New Runabout Crane

In spite of the extensive substitution of machinery for man power in the handling of goods, there is still room for improvement. The human machine, as we may call it, has great adaptability. Within its capacity it can lift a load, carry it over a certain distance along the level, raise that load, and stack it upon others. Hitherto there has been no machine with quite the same range of work where heavy loads are involved. This want has, however, now been met by a British firm which has developed what it calls an electric runabout crane. The essential part of the machine is an electric truck. In some cases use has already been made of cranes on such trucks, but they have generally been small and not powerful cranes mounted on a simple turntable on the truck. In the new design, however, the crane is fixed rigidly to the chassis of the truck, which in turn is specially designed to form a swivel base for the crane. The truck has four pairs of wheels, two at the front, two at the back, and two at each side. The front and back pair of wheels are used for steering, and the two side pair of wheels are used for driving and swivelling. Arranged in this way the truck is capable of lifting a load up to 15 cwt. or more, carrying it quickly over rough ground, swinging it rapidly round into any position, and dumping it wherever required.

Steam Condenser Up-to-Date

James Watt is often described as the inventor of the steam engine,but in point of fact the steam engine existed before he turned his attention to the problem. His invention was really in connection with the arrangement of a separate condenser—which was a source of enormous economy. Ever sinve then the problems connected with condensing steam have been very closely studied by British engineers, and to-day the remarkable efficiency of steam turbines depends very largely upon the perfection of a large and elaborate condensing system. One of the great difficulties is to prevent corrosion of the condensing tubes, caused by the presence of air and other impurities in the water. The most promising solution of this difficulty is what is known as the "closed-feed system," in which only water free from air is utilized. In a particular closed-feed system recently introduced by a British firm the air is removed from the water by mechanical (not chemical) means, with the result that the system operates without any of the troubles formerly encountered. In connection with the same problem another British firm has introduced a new type of pump. It is clear that the closed-feed system will fail if air leaks into the water through the glands and other parts of the pump under pressure, so that any leakage taking place will be of water outwards and not air inwards. The amount of power required to drive this pump compares very favorably with that needed by other pumps for similar work, and there is the further advantage that it is not necessary to tighten up the glands to such a point that risk of wear on the bearings is encountered.

Sherbrooke. Contracts will be let by Mr. Lambert, superintending contractor, and the architect.

St. Antoine, N. B.

Private tenders will be received for the $80,000 church proposed by the congregation of the Roman Catholic Church. R. A. Frechette, 30 Bonnacord St., Moncton, architect.

St. Louis de Gonzague, Que.

Plans are prepared by the Roman Catholic School Commission, Three Rivers, for a $50,000 school. Jules Caron, St. Joseph St., Three Rivers, architect.

Springhill, N. S.

Six room school costing $20,000 contemplated by the Public School Board. Architect not yet appointed. A. B. Wilson, mayor, and also chairman of the building committee.

Thessalon, Ont.

By-law authorizing $30,000 High School will be submitted to ratepayers shortly. T. Wilks, 612 Queen St. E., Ste. St. Marie, Ont., architect.

Toronto, Ont.

Campaign has been launched and Waverly Road Baptist Church expects to commence work on $60,000 Sunday School this spring.

$400,000 college building proposed by St. Andrew's College. Sproatt & Rolph, 36 North St., architects, are preparing the plans.

Canadian National Exhibition is considering the erection of an automotive and an electrical building.

Welland, Ont.

W. E. Foster, Town Clerk, is receiving tenders for the $30,000 market hall until Apr. 6.

CONTRACTS AWARDED

Waterloo, Ont.

Ellert Bros., Park Ave., have been awarded the general contract for the addition to the High School, at a cost of $70,000. J. M. Cowan, 991 Bay St., Toronto, architect.

Lennoxville, Que.

J. R. Ross, 118 Murray St., Sherbrooke, in the market for all material for a school except lumber.

Levis, Que.

Eastern Canada Steel & Iron Works, Quebec, have the contract for steel in the wing being added to St. Levis College. Reinforced Steel, Trussed Concrete Steel Co., Montreal.

London, Ont.

Hyatt Bros., 288 Egerton Ave., have been awarded the general contract for the $50,000 Registry Office. A. M. Piper, City Hall, architect.

Midland, Ont.

C. S. Webb & Cummings Bros. have the general contract for the $30,000 addition to the High School. G. J. Campbell & Co., have the electrical contract and Armstrong Bros., the plumbing and heating contracts.

Montreal, Que.

General contract for an addition to a school for the Protestant School Board awarded to John McGregor Ltd., 44 Closse St.

Ottawa, Ont.

Plastering of Ottawa Hospital will be done by McLaughlin & Tufano, 649 Gilmour St., who received the contract [illegible]

St. Catharines, Ont.

Pigott-Healy Construction Co., 36 James St. S., Hamilton, have been awarded the general contract for the Registry Office by the Lincoln County Council.

Business Buildings and Industrial Plants

Alexandria, Ont.

Site being cleared for an hotel costing $20,000-$30,000 to replace structure recently destroyed by fire.

Cornwall, Ont.

Cornwall Motor Sales will complete sales rooms at a cost of $10,000. J. Eamer, general contractor.

Hamilton, Ont.

F. Freeborne, c/o Geo. I. Evans, architect, 310 Clyde Bldg., has three stores under construction.

Hyde Park, Ont.

John Irwin, Lobo, has the general contract for a $15,000 garage and service station for R. E. Morris. Work will commence on July 1.

Kitchener, Ont.

Tenders are being received until Mar. 31 for $40,000 car barns for the Light Commission. Geo. Clarke, secretary.

Montreal, Que.

Tenders for a $150,000 warehouse for Drummond & McColl Ltd., 28 Victoria St., being received by Fred G. Robb, 127 Stanley St., until Har. 31.

Newcastle, N. B.

$15,000 business block to be built by T. G. Durick, Newcastle. R. A. Frechette, architect, 30 Bonaccord St., Moncton, will call tenders about Apr. 15.

Tenders will be called by R. A. Frechette, 30 Bonaccord St., Moncton, about Apr. 15 for a business block costing $20,000.

Niagara Falls Centre, Ont.

A syndicate may build a canning factory. W. P. Dixon, 5 Centre St., president.

Owen Sound, Ont.

Plans are being prepared for alterations to the Savoy Theatre. Cost will run about $10,000. Hall & Duerr, Lumsden Bldg., Toronto, architects.

Sault Ste. Marie ,Ont.

Northern Feed & Seed Co. Ltd., 112 Bruce St. receiving tenders on a warehouse to cost about $9,000. A. G. Smith, 764 Wellington St. E., manager.

Toronto, Ont.

Stone cutting factory costing $9,000 being built for Geo. McIntyre, 27 Burlington Cres. Owner is receiving tenders for a store front, electrical, heating, plumbing, etc.

Grimshaw Bros., 1176 Danforth Ave., are building four stores. Contracts for roofing, plumbing, electrical, plastering and heating to be let.

Canadian Oil Co., Strachan Ave., will build a service station on Yonge St. Work will proceed at once.

D. H. Burnham, 260 Lauder Ave., is preparing plans for a factory for J. Phillips.

B. Swartz, 236 Dundas St. W., is preparing plans for two stores and apartments costing $20,000.

Excavating is in progress for ten stores and flats costing $15,000 for D. Mentone, 938 Keele St.

Windsor, Ont.

Stores and flats costing $18,000 being built by C. H. Clarke, 1231 Pelissier St., for A. Abramson, 201 Pitt St. E.

CONTRACTS AWARDED

Montreal, Que.

Alterations to the Almy building for the Belgo Canadian Realty Co. are being made by Anglin Norcross Ltd., Victoria St.

Toronto, Ont.

Sullivan & Fried, 81 Victoria St., have the general contract for an addition to the factory of Cutten & Foster, 302 Church St.

Canadian Bridge Co., Walkerville, has the contract for steel for the Ford assembly plant on Danforth Ave. A. B. Ormsby Co. Ltd., 48 Abell St., are supplying steel sash.

Residences

Hamilton, Ont.

Twenty-five residences costing $125,000 contemplated by James Byers, Osborne Chambers. Interetsed in prices of all materials.

Merriton, Ont.

Geo. M. Elson, St. Catharines, contemplates a $6,000 residence.

Montreal, Que.

W. Begnoche, 105 Riveard St., will build a residence costing $7,000.

From Mar. 26 to Apr. 14 tenders will be received by P. L. W. Dupre, 20 St. James St., for five residences and four garages.

Plans for seventeen residences being prepared by Barrott & Blackader, Canada Cement Bldg.

Tenders will be called shortly for an apartment house costing $30,000. S. Frappier, architect.

Ottawa, Ont.

Frank E. Ault, Booth Bldg., plans to erect a residence costing $12,000. Tenders will be received until Mar. 31.

Millson, Burgess & Hazelgrove, 185 Sparks St., are preparing plans for a residence for Mr. Mitchell. Building will cost about $8,000.

Point Grey, B. C.

McDonald Bros., 1070 Comox St., Vancouver, are excavating for a residence costing $6,500.

St. John, N. B.

Sketch plans are being prepared for a $12,000 residence for W. G. Eastabrooks by G. H. Wilson, Princess St.

Stratford, Ont.

Jas. Russell, Downie St., is preparing

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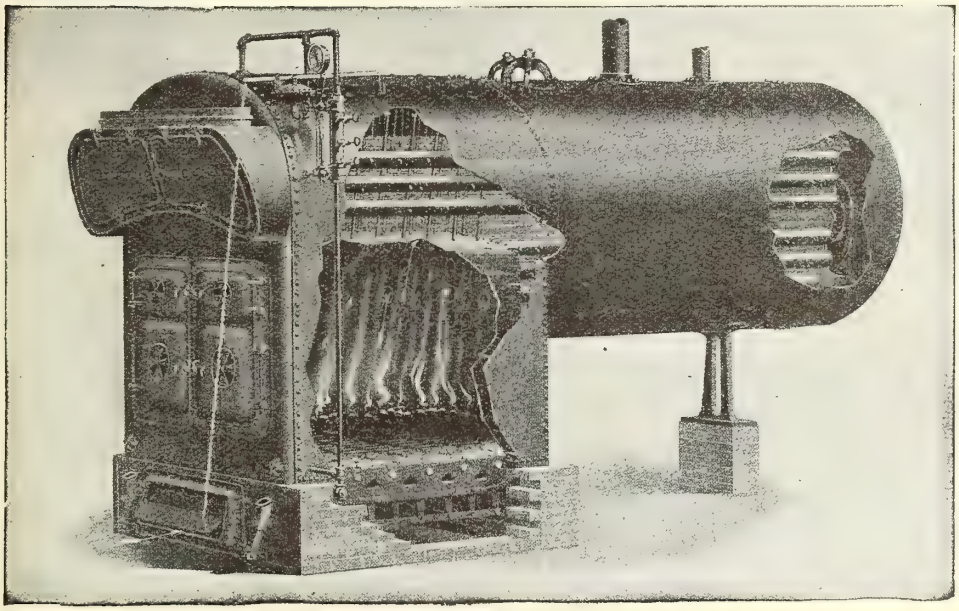

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First class workmanship—Best quality of materials—Prompt delivery
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Office and Works—14 Strachan Avenue, TORONTO, Canada

Montreal Sales Office—385 Beaver Hall Square

plans for a residence for S. Grosh, Windsor Hotel.

Toronto, Ont.

H. A. Johnston & Co., 412 Lake Front, will shortly commence work on 30 or 40 residences. Owners receiving tenders on all trades.

Between fifty and sixty residences are contemplated by H. A. Johnston & Co., 412 Lake Front. Builder plans to start shortly and will let all trades.

Jas. Thompson, 48 Laws St., has excavated for a residence costing $9,500.

Kennedy & Bowles, 73 Chelsea Ave., are building a residence costing $8,000.

Two residences costing $5,000 each are contemplated by James Murray Robertson, 94 Spadina Rd.

Nine residences and garages, costing $7,000 each, are being built by G. F. Cudmore, 80 Indian Cres. Eight residences with garages of the same value are also under construction.

Harry McGee, 61 Forest Hill, plans a residence on Fairlawn Ave.

Three residences costing $22,000 contemplated by Carter & Kaake, 2002 Queen St. E.

About Apr. 1 B. Swartz, 336 Dundas St. W., will call tenders for all trades on a duplex residence.

B. Swartz, 336 Dundas St. W., is preparing plans for an $18,000 residence.

Seven residences contemplated by S. H. Lamb, 31 Oakdene Cres. Work will proceed about Apr. 15.

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STANLEY MOSS, MANAGER
FIDELITY AGENCY
OF CANADA LIMITED
THIRTY SIX TORONTO STREET

Four residences on Dunvegan Rd. contemplated by Jno. Carlisle, 144 Forest Hill Rd.

Wallaceburg, Ont.

Dr. Taylor is having plans prepared for a residence to cost about $10,000.

CONTRACTS AWARDED

Winnipeg, Man.

H. Sigurdson, 808 Great West Permanent Loan Bldg., has the general contract for a residence for Dr. C. Hunter, Boyd Bldg., which will cost about $13,000.

Power Plants Electricity and Telephones

Buckingham, Que.

David Roy, Town Clerk, is receiving tenders for a $30,000 water power plant until Apr. 3. Rou & Toupin, St. Catherine St. E., Montreal, engineers.

Cataract, Ont.

An addition is planned by the Engineering and Radio Supplies Ltd., Orangeville, to the power house. R. G. Lee, 28 Wellington St. W., Toronto, president.

Kirkland Lake, Ont.

About May 1 tenders will be called for a power transmission line costing $8,000. M. Campbell, clerk.

St. George, N. B.

$20,000 transmission line and street lighting system being installed by the town, which has contracted for supply of power. Canadian General Electric Co., St. John, supplied generators. Contracts for installing machinery and building the transmission line will be let shortly.

Toronto, Ont.

Toronto Electric Commissioners want tenders on an addition to the Bay St. sub-station. Tenders will be received at the engineering department, Nelson & Duncan Sts., until April 5.

Miscellaneous

Ottawa, Ont.

New roof for the main building in the exhibition grounds proposed at a cost of $10,000. Geo. Pink, president of the Exhibition Association.

CONTRACTS AWARDED

Hamilton, Ont.

Contracts for civic supplies awarded as follows: Broken stone, etc., Canada Crushed Stone Co., Dundas; asphalt, sand, sand and gravel, Doolittle & Russell Ltd., Hamilton; sewer pipe, Hamilton & Toronto Sewer Pipe Co., Toronto; cast iron pipe, Gartshore-Thompson Pipe & Foundry Co., Hamilton; valves and extension boxes, Forewell Foundry Ltd., Walkerville, Ont.

Matane, Que.

The general contract for dredging awarded by the Dominion Government to H. Dussault, Quebec, at $98,600.

Ottawa, Ont.

Ottawa Suburban Roads Commission has awarded the general contract for 2,000 bbls. of cement to Wright & Co., Catherine St.

FIRES

Jacquet River, N. B.

In two months Paul Doyle will rebuild $8,000 hotel destroyed by fire.

Montreal, Que.

Hospital owned by the Rev. Sisters of Providence destroyed with $1,000,000 loss. Building will be re-built.

MacLean Reports
Cover Canada

MacLean Building Reports will give you accurate, advance information on every building and engineering contract of consequence in the Dominion.

These reports are issued daily and reach subscribers in ample time to bid on the work or submit prices for the machinery, equipment, materials or supplies required.

Subscriptions may be placed for any one city, portion of a Province or more than one Province. Rates range from $25 yearly for the smallest cities to $500 yearly for the entire Dominion.

Hundreds of firms are deriving much financial benefit from the use of MacLean Building Reports. Tell us what territory you cover and put it up to us to show how we can help you get more business.

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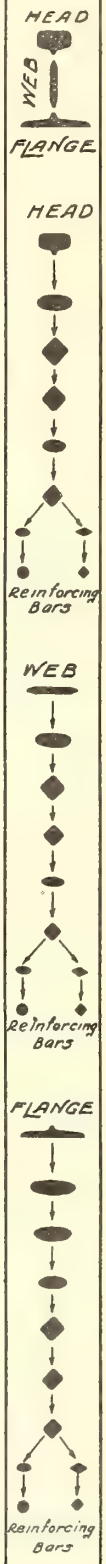

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of Canada, Limited
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Sturtevant
PUTS AIR TO WORK

May Widen Strand

People going to London in 1924 are likely to find a new Strand. Plans are nearing completion for widening the famous thoroughfare to eliminate the bottle neck.

Work has begun on tearing down all the buildings on the south side from Wellington Street to the Savoy Hotel. New and handsome business premises will be erected in the place of the old buildings.

Build Spiral Chimney

One novel solution of the engineering problem of building tall chimneys to withstand the tremendous pressure of winds at high velocity has been offered by a British airplane engineer who has designed a strange spiral chimney in such a way that it presents a corner to winds from any direction.

Each brick at the corners is displaced one sixteenth of an inch, so that the chimney forms a spiral. As a result, each corner at the top of the stack is directly above the middle of one side of the base. Thus, the thrust of a wind is distributed over two sides of the chimney, instead of being concentrated on one side, and thin walls will withstand a wind pressure that might demolish the chimney if the sides were flat. A spiral chimney can be built without added ex-

Rotary Broom

To keep dirt and trash from the rails—a primary necessity for proper working of signals and the inspection of rail bondings—the Pennsylvania Railroad has developed a labor saving track sweeper for use in mountain sections.

The sweeper consists of a rotary steel broom three feet in diameter, mounted beneath an old flat car on special hangers that allow it to be raised or lowered at will. The broom turns at about 100 revolutions a minute and is chain driven from a gasoline engine on the deck. A steel pan receives the sweepings from the broom and deposits them on a belt conveyor which carries them to a hopper from which the dirt can be dropped at any convenient location.

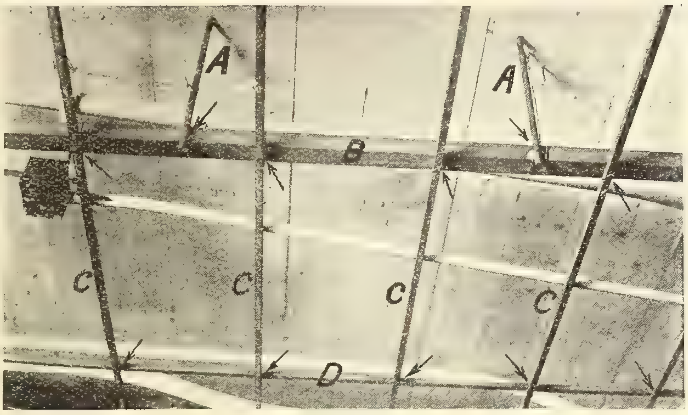
The track sweeper is drawn by a small locomotive, and its capacity is sufficient for the sweepings from a mile of track. The car has noticeably cut maintenance cost by the elimination of hard labor.

Indian Railways

After a spirited discussion, the Legislative Assembly by a vote of 67 to 27 decided to reduce the railway estimates of sixty-four crores (£64,000,000) by 114 lakhs (£1,140,000).

Several of the Indian members claimed that a further reduction in the railway administration expenditure was possible. Others, whilst thinking this possible, said they considered that the total expenditure on the railways chargeable to revenue could be reduced by transferring a portion of the railway annuities, representing redemption of capital from revenue, to capital account. The result of this would be that the capital portion of the annuities would be paid from borrowed money instaed of from current revenue.

Both Sir B. P. Blackett and Sir W. M. Hailey, members of the executive council, strongly opposed the view held by the majority of the Assembly members.



Welding ceiling construction Arrow indicates points of welding

Electric Arc Welding

has thousands of applications from the construction of steel work carrying suspended ceilings, as shown in the cut, to the manufacture from sheet steel of a multiplicity of articles to supersede costly cast iron.

Lincoln Electric Company of Canada, Limited

136 John St., Toronto

We have four machines in daily use in our shops in new construction and repairs. No preheating necessary. We repair Boilers, Steam Shovels, Hoisting Engines, Cylinders, etc., etc. Manufacturers of well known Lincoln Motors and Electric Welders.

For Road Building and Construction Work

Select your requirements in Crushed Stone, Gravel Lime, Cement, Sand, Etc, —from—

BRITNELL & COMPANY, LIMITED

C.P.R. Crossing Yonge Street North Toronto

Day Phone, North 664 Night Phone, North 2107

Current Prices of Building and Engineering Materials

		Toronto	Montreal	Winnipeg	Vancouver
CEMENT (Delivered on job):—					
Retail lots including bags	per bbl.	$4.60	$4.16	$4.80	$3.70
Car lots, including bags	per bbl.	3.60	3.48	4.20	3.35
Refund on bags	each	.20	.20	.20	
LIME (Delivered on job):—					
Lump, in retail lots	per ton	14.30	14.00	.58 bu.	2.70 bbl
Lump, in car lots	per ton	12.70**	11.00	13.80 ton*	2.60 bbl
Hydrated, in retail lots	per ton	20.00	26.00	.63 bag*	30.00
Hydrated, in car lots	per ton	19.00	21.00	.56 bag*†	25.00
BRICK and TILE (Delivered on job):—					
Common face brick	per M.	24.00	16.50*	19.00	30.00
No. 1 dry pressed brick	per M.	31.00	30.00	36.00	70.00
No. 2 dry pressed brick	per M.	29.00	25.00	32.00	
Enamelled brick	per M.	125 up to	230.00	185.00	150.00
Wire cut brick, for foundation work	per M.	21.00	19.00		50.00
Sand lime brick	per M	17.00		18.00	
Hollow building tile	per M.			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	60-95	60-75	85-100	80.00
Fire clay	per ton	13-20	15-16.00	35.00**	22.00
STONE, SAND and GRAVEL (f.o.b. cars on siding):—					
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.00 yd
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 "	" "
Crusher run	per ton	2.20½		3.00 "	" "
Rubble stone	per ton	2.45	1.70	15.00 cord	" "
Gravel, 2 in. screened	per ton	2.05		2.45 yd.	" "
Gravel 1 in. screened	per ton	2.31	1.50	2.75 "	" "
Sand, screened	per ton	1.42½	1.25	1.90 "	" "
Pit run	per ton	1.52¼	1.25	1.90 "	" "
STEEL and IRON (f.o.b. warehouse):—					
Mild steel bars, ¼ in. and heavier	per 100 lbs.	3.75 base	3.50 base	4.60	4.00
Bands 3/16 in. and lighter	per 100 lbs.	4.25 "	3.50 "	5.10 base	
Hoops	per 100 lbs.	5.00 "	4.50 "		
Twisted and deformed bars	per 100 lbs.	3.75 "	3.50 "	4.55	4.00
Angles, channels and tees under 3 in.	per 100 lbs.	3.90 "	3.75 "	5.35	6.00
Structural shapes	per 100 lbs.	4.00 "	3.75 "	5.05 base	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.40 "	3.75 "	5.15	6.25
Plates—3/16 in.	per 100 lbs.	3.60 "	4.10 "	5.55	6.50
Plates—10 gauge	per 100 lbs.	4.40 "	4.50 "	5.45	6.50
Black sheets—28 gauge	per 100 lbs.	5.50 "	5.00 "	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.65 "	7.00 "	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	6.65 "	7.00 "	7.70	8.25-8.50
Rivets	per 100 lbs.	6.25 "	6.00 "	7.00 base	
Cast iron pipe	per ton	65.00	60.00		
VITRIFIED CLAY PRODUCTS (Delivered on job):—					
Sewer pipe, 4 in.	per ft.	.40	.30	.35	.28
Sewer pipe, 6 in	per ft.	.60	.45	.45	.48
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.55
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.70
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.85
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00	.90	.65	.75
Chimney tops	each	9.00	3.50–5.00	7.50	4.50–6.00
Discounts		45 % truck lots 50 % car lots	20 % 50 %	5 %	

CEMENT:—*Discount of 10 cts. per bbl. in 20 days. Price f.o.b. cars is $3.75 †Subject to 5% discount. **Excluding bags
LIME:—*Discount of 5%. †Bag of 50 lbs. **Price f.o.b. cars is $11.70.
BRICK AND TILE—*f.o.b. plant.
STONE SAND AND GRAVEL:—*Winnipeg prices subject to 5% disco **Toronto prices include sales tax.

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Canadian Made

Sand and Gravel Handling Plants

Excavating Conveying Screening
Elevating Crushing Washing
and Storage Equipment

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The Dominion Road Machinery Co., Ltd.
Goderich — Ontario

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OIL
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GEAR
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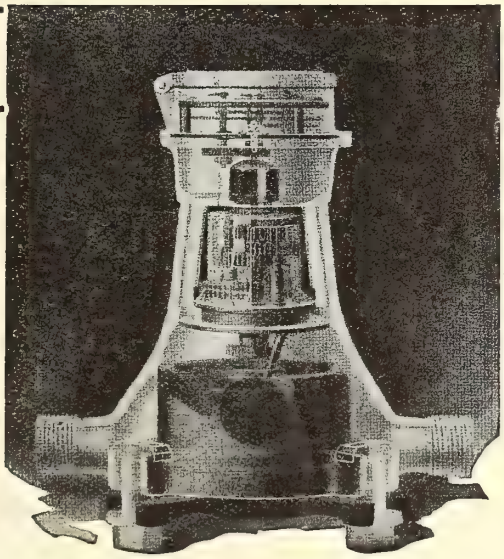

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Full information will be gladly furnished on request

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Winnipeg:—Walsh & Charles, 406 Tribune Building. Maritime Provinces:—James Robertson, St. John, N.B.
Vancouver:—Messrs. Gordon & Belyea, Limited, 148 Alexander St.

CURRENT PRICES OF BUILDING AND ENGINEERING MATERIALS— continued

Lumber (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver*
Flooring, 1 x 3 and 4 in., clear, E. G. fir	per M.	90,00	60.00	94.50	55.00
Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	70.00	65.00	63.00	30.00
Flooring, No. 1 pine	per M.	70.00	80.00	64.80	
Flooring, No. 1 Spruce	per M.	48.00	45.00	40.50	
Flooring, birch and maple, 13/16 in. clear	per M.	130.00	110.00	171.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	130.00	125.00	157.50	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	70.00	65.00	63.00	30.00
V joint, No. 1 pine	per M.	70.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	43–58	45.00	67.50	
Red and Jack Pine, 2 x 4 to 12 in., com. rough	per M.	44/58	70.00	40.50	
Hemlock, 2 x 4 to 12 in.	per M.	40/44	40.00	42.50	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	40–50.00	50.00	38.70	11.00-13.50
Spruce, 1 and 2 x 4 to 12 in.	per M.	44/58	45-35	38.70	
Timbers, fir, 10 x 10 in. and up	per M.	65.00	58.00	55.00 base	17.-22.00
Lath, No. 1 white pine	per M.	16.00	12.00	12.60	
Lath, M. R. spruce	per M.	10.00	8.50	11.25	7.00
Shingles, XXX B.C. cedar	per M.	6.50	5.00	6.30	3.40
XX B.C. cedar	per M.	4.50	4.25	4.50	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	115.00	55.00
Fir casing	per M.	1 ct. per in.	100.00	115.00	
PAINTS, OILS, COLOURS (delivered):—					
White lead ground in oil, less than ton lots	per cwt.	14.55	13.75	15.60	15.80
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	22.00
Putty in bulk	per cwt.	5.95	4.25	5.50	9.25
Steel sash putty in bulk	per cwt.	6.45	6.00	8.00	7.75
Boiled linseed oil, in bbls.	per gal.	1.28	1.18	1.26	1.28
Raw linseed oil, in bbls.	per gal.	1.25	1.15	1.23	1.25
Turpentine, in bbls.	per gal.	2.25	2.00	2.50	1.60
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 9/10	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 4/5	.45
PLASTER (Delivered):—					
Hard wall plaster, sanded	per ton	13.50	15.00	25.40	30.00
Plaster of paris, in bbl. lots	per bbl.	6.00	5.35	1.60 bag*	7.50
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu.	1.50
LABOR:—					
Bricklayers	per hr.	1.00	.80–.90	1.15	1.06¼
Structural Iron Workers	per hr.	.85	.50–.75	1.25	1.00
Plasterers	per hr.	1.00	.80	1.05	1.06¼
Hoisting Engineers	per hr.	.70–.80	.50	.90–1.10	1.00
Plumbers	per hr.	.90	.60–.75	1.00	.90
Carpenters	per hr.	.80	.65	.90	.81¼
Painters	per hr.	.75	.55–.65	.80	.81¼
Electrical Workers	per hr.	.80	.65	.70– .90	1.00
Roofers	per hr.	.65	.65		.90
Laborers	per hr.	.40–.50	.30	47½–.55	.50–.56¼
Sheet Metal Workers	per hr.	.75			.90

LUMBER:—*Owing to the general unstable condition of the present lumber market, Vancouver dealers refuse to quote any prices at all especially for Prairie or Eastern publication. The prices are, moreover, fluctuating from day to day. Such prices as we quote are, therefore, averages and not standard.

PLASTER *Including bags.

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PEA GRAVEL
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Rapid Truck Delivery. Just Phone
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Superior Tracing Papers

"Vellum" No. V-110 Cream Tint, "Vellum" No. V-120 Natural Tint, "Veltex" No. V-140 Blue Tint.

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and therefore superior to tracing cloth, as drawings to scale remain accurate indefinitely.

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A heavy, strong, and exceptionally transparent paper

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Does not deteriorate with age and will not become brittle. Supplied in rolls on large diameter cores, so that it will lie flat on the board. Sheets cut to order.

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A feature exclusive to Monighan Excavators which the contractor must see in action but once to appreciate.

Over any ground—soft, muddy or rough, it "walks"—the excavator without planks, skids, track or trackmen.

Labor cost is cut, more material handled and the whole job speeded up.

Catalog No. 19 explains these advantages in detail.

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MEDART STEEL LOCKERS ---*Best that money can buy*

IN planning schools, clubs, or industrial buildings, take advantage of Medart Engineering Service and their fifty years experience in this work.

Medart Engineering Service covers the whole field of gymnasium, locker room and swimming pool equipment.

Full particulars may be obtained from

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STANDARD LIME COMPANY
LIMITED

JOLIETTE, QUE.

LARGEST PRODUCERS OF LIME IN CANADA

PLANTS

CRUSHED STONE	LIME	SAND
JOLIETTE, QUE.	JOLLIETTE and ST. MARC, QUE.	ST. FELIX DE VALOIS, QUE.
C.N.R. & C.P.R.	C.N.R. & C.P.R.	C.P.R.

PARIS SAND & GRAVEL
COMPANY

Washed Concrete Sand
Dry Screened Concrete Sand
1" Washed Screened Gravel
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We make a speciality of Pit Run Gravel, in fact we can give you what you want.

Capacity 30 cars per day.

RURAL ROUTE No. 2
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Steps and Base Courses

require
a close-grained, hard wearing stone

Queenston Blue Dolomite

will fill your requirements.

Will not stain
Always clean and bright

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For All Purposes

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Tenders

A few dollars spent in advertising your proposals in the

Contract Record
and Engineering Review

would result in additional competition which might save your city or town or your client many hundreds of dollars

MARBLE & CUT STONE

We stand ready to supply you at short notice with imported and domestic marbles or cut stone of every description. We shall also be glad to figure on your requirements and to give you the benefit of our long experience in any work you may have in mind. This without obligation.

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LIMITED
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Have You Ever Been Held Up For Brick?

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Quality and price are always right
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Largest and Best Equipped Plant in Ontario

As evidence of our desire to give customers the highest grade product and the best service, we have installed the most modern equipment known to the industry.

A daily output of 3500 tons is being achieved and the stone, all sizes, comes clean and even in size.

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Hagersville Stone for Concrete and Macadam Roads

Long experience in road building has taught most contractors the superiority of stone from the Hagersville Quarries. With recognition of its quality came steadily increasing orders, to meet which we have recently enlarged our crusher plant to more than double its former capacity. The best service is thus assured to those who order now. Let us quote.

HAGERSVILLE QUARRIES LIMITED

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Have You Changed your fire protection system to conform to Ontario Provincial Board of Health New Regulations?

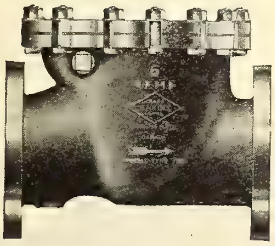
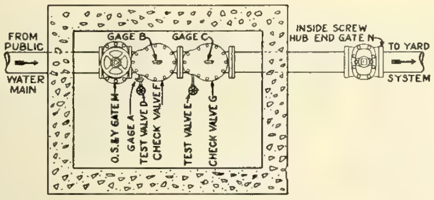
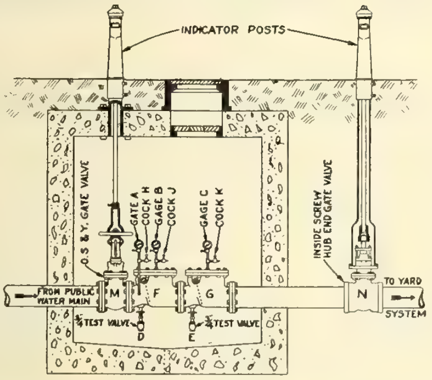


Fig. 481

Here we show you a
Iron Body "Special" Type
Jenkins
F. M. Swing Check Valve

and below a diagram showing correct method of installation.
These valves are approved by the Ontario Provincial Board of Health and are used for connections between a fire protection system having an auxiliary supply that is pumped and a municipal water supply.
Valves are designed to resist corrosion and disarrangement of parts and two of them being connected in series prove most efficient in operation.
Detailed particulars, prices and copy of Catalog No. 9 will be mailed on request.





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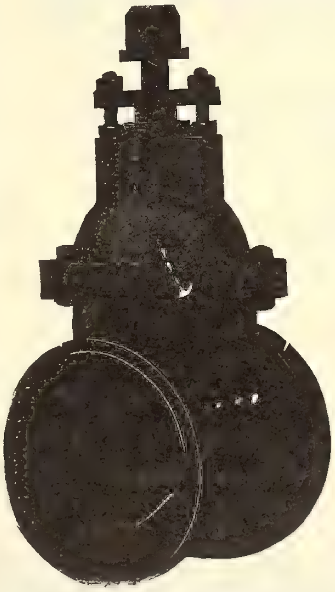
MADE IN CANADA

Strong, Substantial and Modern Designs.
Prices right.
Write for prices and see.



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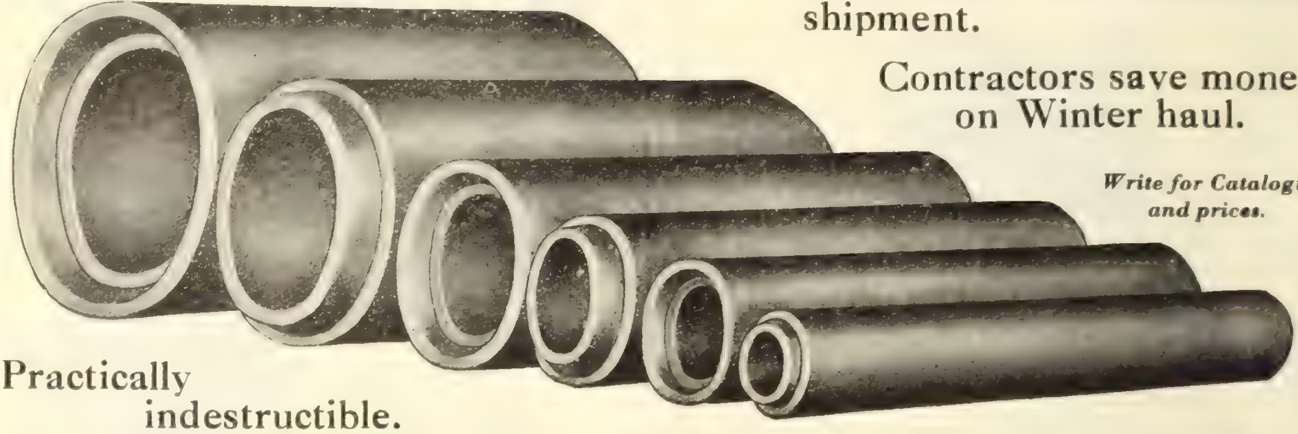
Hard Steel Wire Reinforcement

Large stock of well matured pipe ready for immediate shipment.

Contractors save money on Winter haul.

Write for Catalogue and prices.



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Best Manilla Rope
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stand for superior quality both of materials and workmanship at prices which, durability considered, mean greatest economy.

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That Flooring Job—

What materials will you use?

"Empire Brand" Hardwood flooring will insure it being a first class job, satisfactory to yourself and the customer. We can supply it in Maple, Birch, and Plain and Quarter Cut Oak.

Quick Delivery

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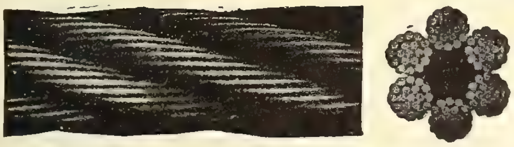

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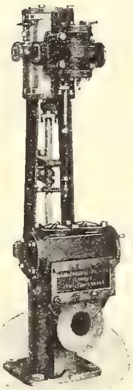

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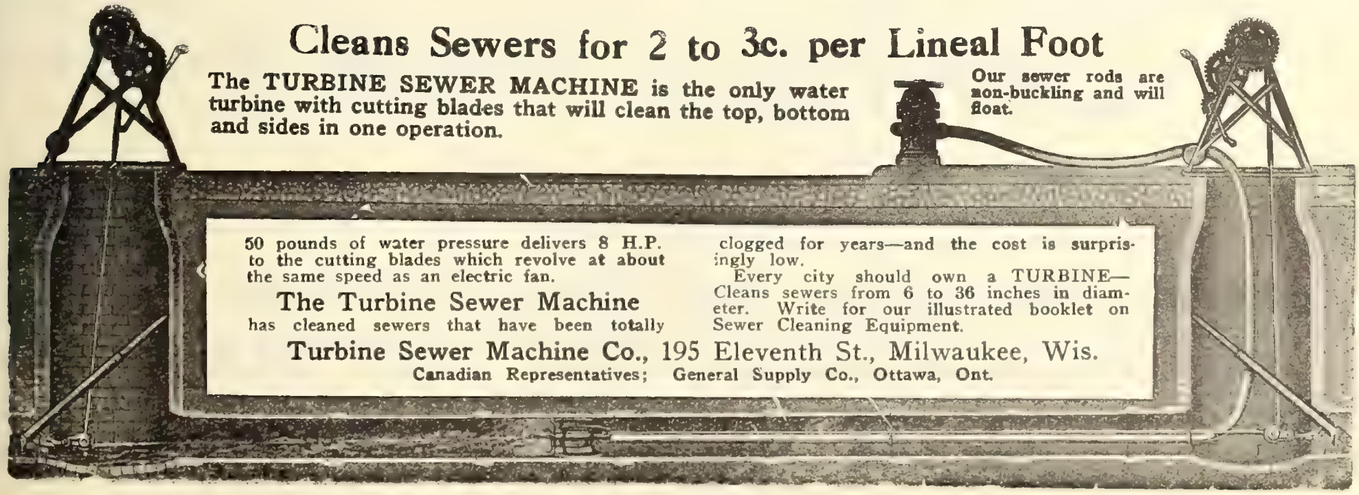
Our watchword is "The Best in Pumps"

The Smart-Turner Machine Co., Limited
Hamilton - Canada



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Our sewer rods are non-buckling and will float.

50 pounds of water pressure delivers 8 H.P. to the cutting blades which revolve at about the same speed as an electric fan.

The Turbine Sewer Machine has cleaned sewers that have been totally clogged for years—and the cost is surprisingly low.

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That is Clean, Tough Stone of a Quality suitable for Macadam Road and Concrete. We can supply you in any size or quantity. Our Service is unexcelled and our prices right.

Phone or write us for quotations when you are in the market

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One dollar per day saved on each bricklayer by using

RENFREW LIME

Because the mortar requires less tempering on the board. It will not set too quickly, and allows bricklayer to bed more bricks at a time. Bricks are easier bedded down. All these advantages helps the bricklayer to lay many more bricks each day. The mortar sets very hard. The lime will take more sand, and costs no more than other limes.

Jamieson Lime Company

Manufacturers: LIME, BRICK, FARM TILE.
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For exteriors there is nothing more attractive than our Enameled Brick in Mottled effects which we can furnish in endless variety, or plain white can also be used to advantage.

Year after year buildings faced with our product are cleaned by the simple and inexpensive process of washing down with caustic soda and water.

Five or twenty years after erection a building so cleaned is to all outward appearances a new structure.

Our Quality is unexcelled. Our prices most reasonable.

For thirty years our product has given universal satisfaction for exteriors—interiors—courts.

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Manufacturers of Enameled and Fire Brick
Dealers in Face Brick of all Colors and Textures.
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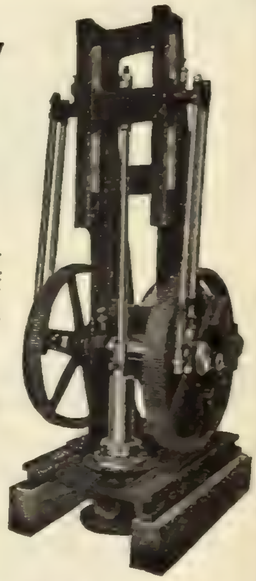
Water Supply from Deep Wells

is obtained at a minimum cost by use of our deep well pumps.

Write for Bulletin 26 explaining the use of Cook's Patent Brass Tube Well Strainer.



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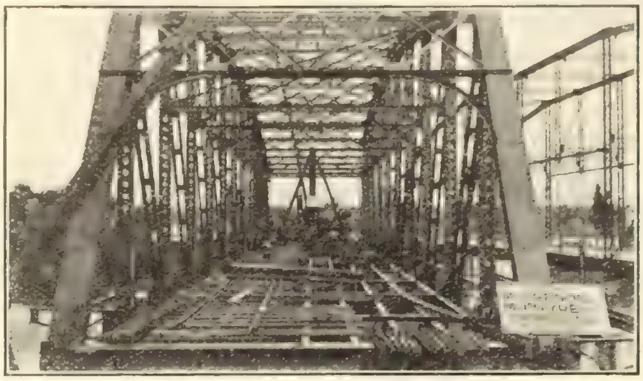

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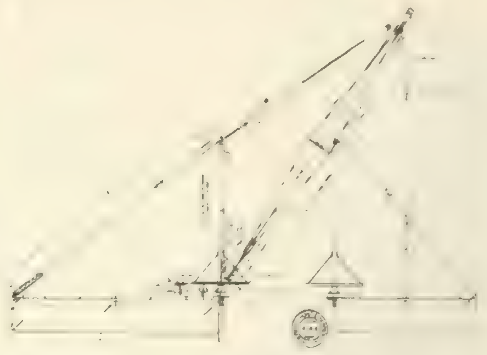

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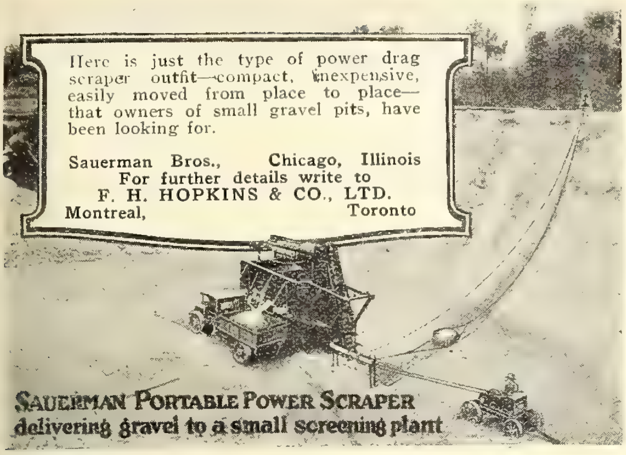

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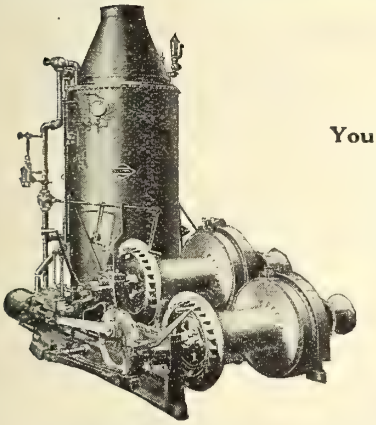

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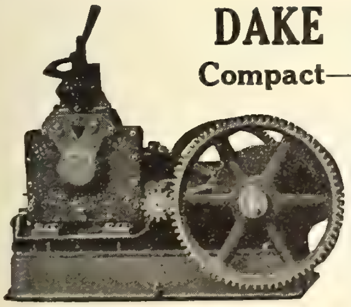

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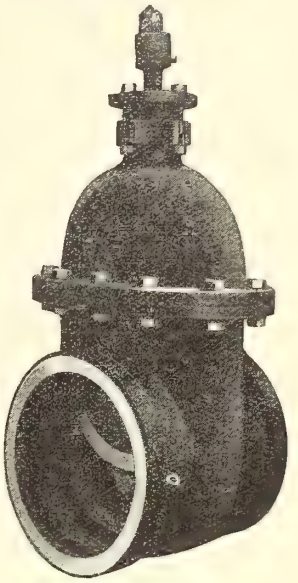

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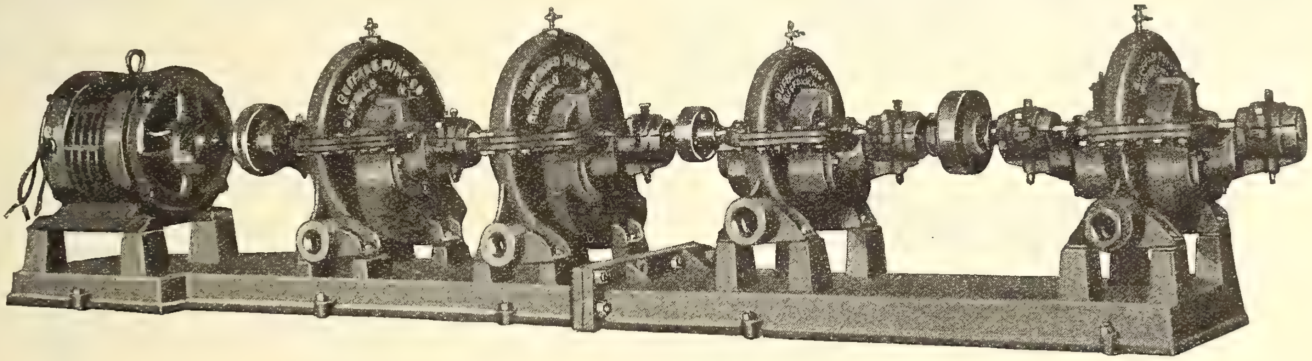

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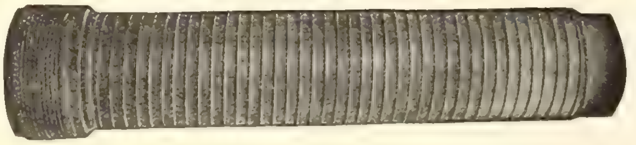

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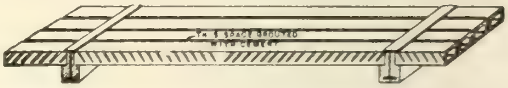

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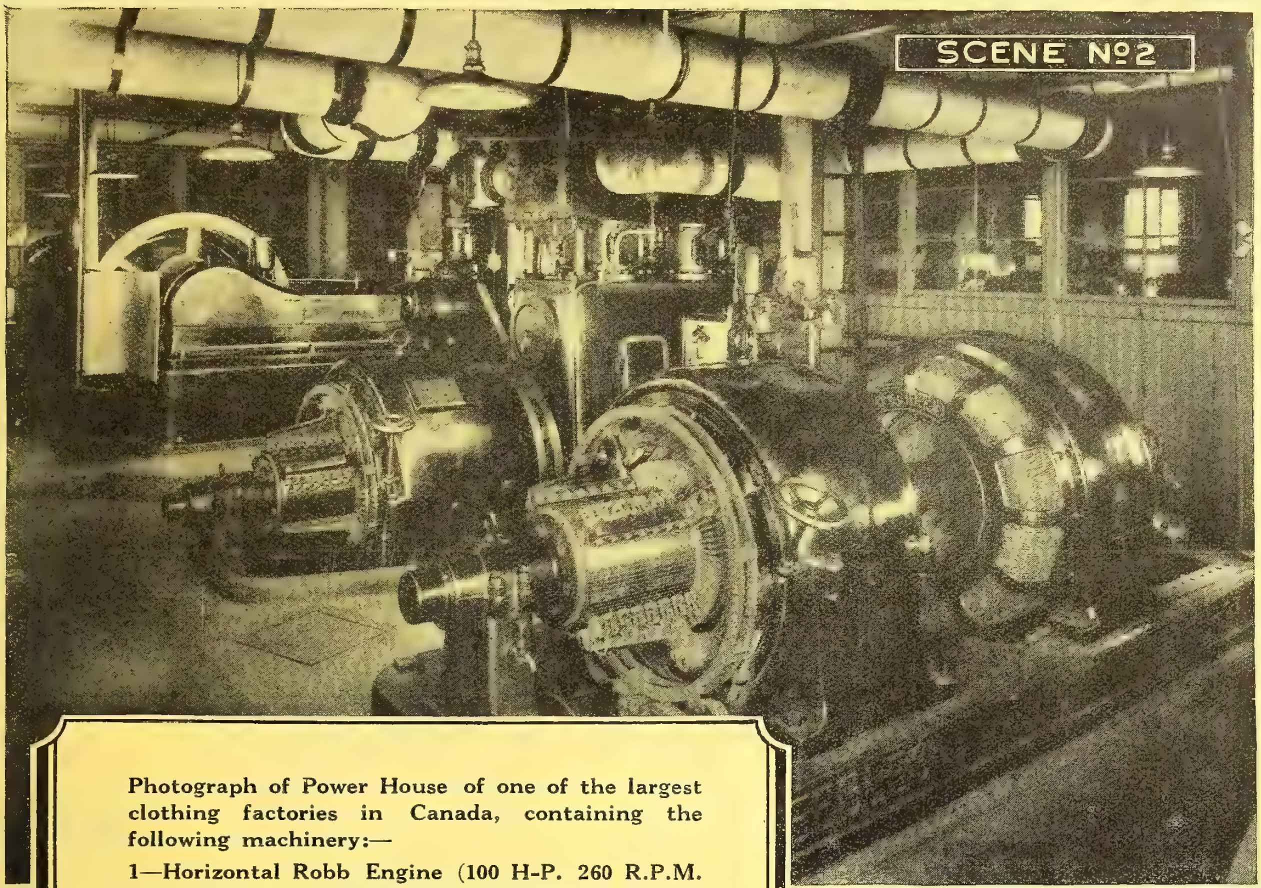

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Vol. 37 Toronto, April 4, 1923 No. 14

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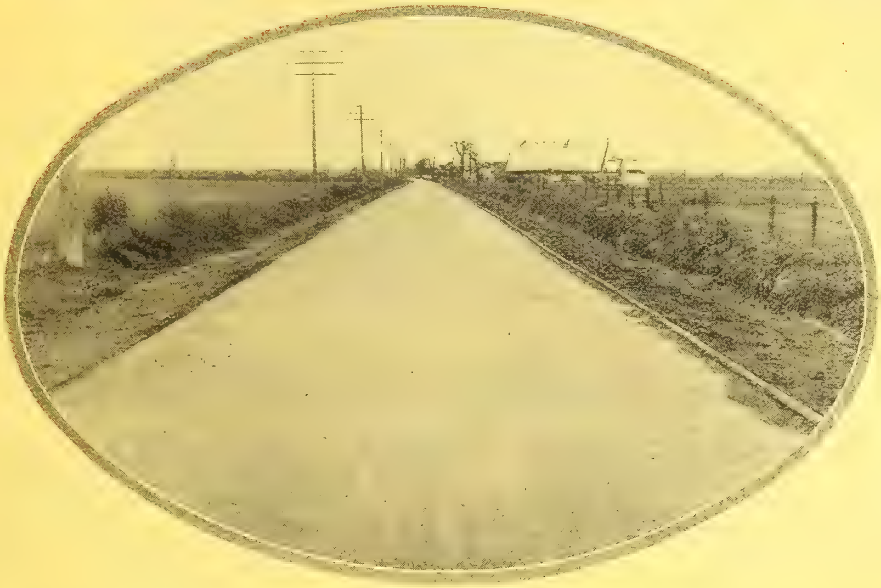

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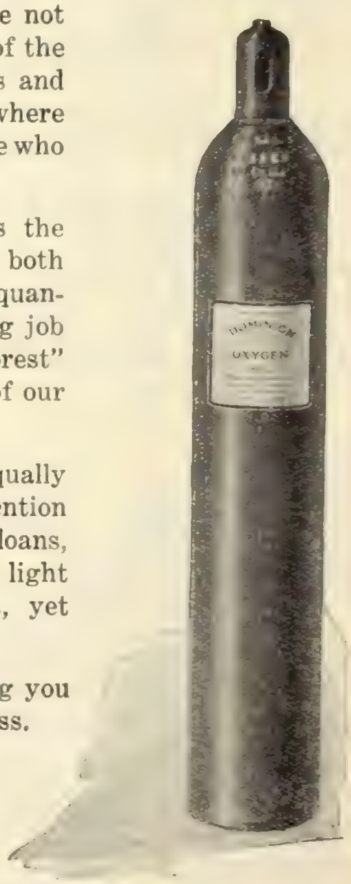
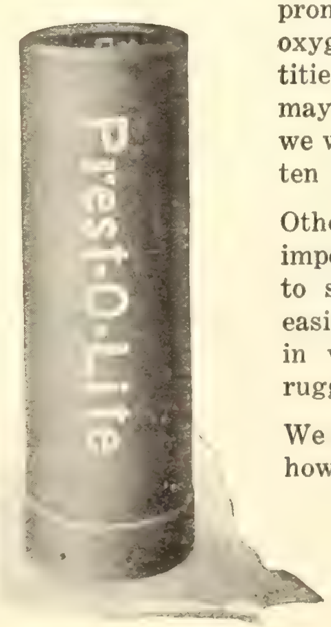
We Are Your Neighbours

Unlike the man who made the better mouse trap and built his house deep in the forest where the world had to find a path to his door, we are not only making oxygen and dissolved acetylene of the highest quality, but have located our plants and warehouses in the busy commercial centers where our products are most easily available to those who need them.



An important part of Dominion Service is the promptness with which you can secure both oxygen and dissolved acetylene in unlimited quantities. Even though your plant or contracting job may be as inaccessible as the "house in the forest" we will find the shortest way to it from one of our ten plants and distributing warehouses.



Other features of Dominion Service are equally important to you—lowest prices, careful attention to shipping instructions, liberal cylinder loans, easily-handled cylinders of the newest types, light in weight to save transportation charges, yet ruggedly constructed.

We shall appreciate an opportunity of telling you how Dominion Service will help your business.

DOMINION OXYGEN COMPANY, LIMITED

Operating the Welding and Cutting Gas Division of
PREST-O-LITE COMPANY OF CANADA, LIMITED

General Offices: 80 Adelaide St. East, TORONTO.

DISTRIBUTION POINTS: **Hamilton, Merritton, Montreal, Oshawa, Quebec, Shawinigan Falls, Toronto, Welland, Windsor, Winnipeg.**

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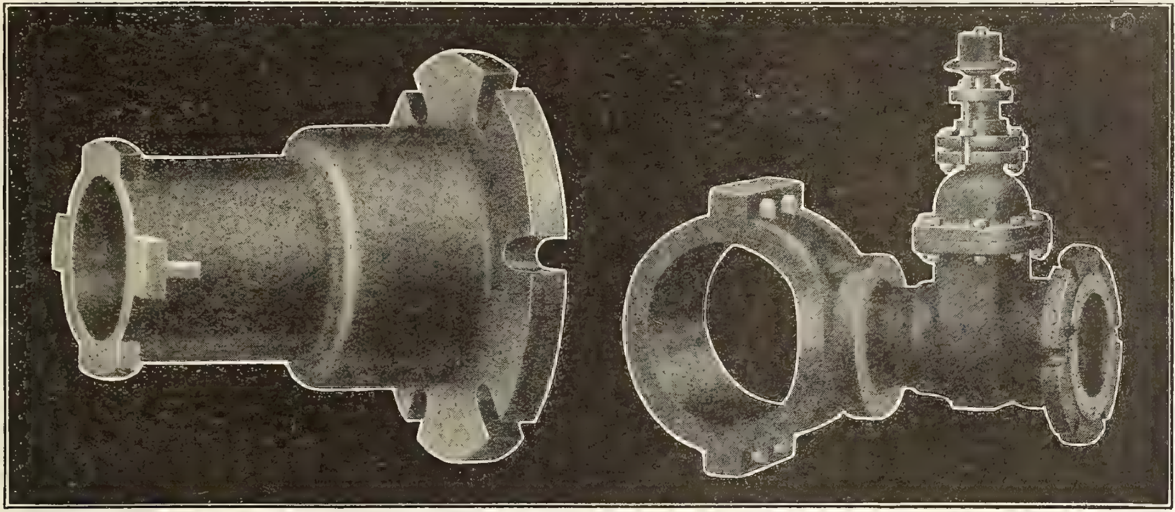


MUELLER "C" DRILLING MACHINE

For Making Lateral or Branch Connections

This machine is the perfected product of exhaustive experiment and practical experience over a period of years.

Skeleton in form, with bevel gear drive and automatic feed, it can be operated by one or two men. For ease of operation and speed in cutting it has no peer. In its construction throughout—in materials and workmanship—the "C" Drilling Machine represents the highest *MUELLER* standard. Makes connections from 2″ to 8″ inclusive, in pipe from 4″ to 48″ in size.

For making large connections to mains, Sleeves and Valves can be supplied in all sizes from 4 x 2 to 48 x 48—or, when desired, Dry Pipe Connections.

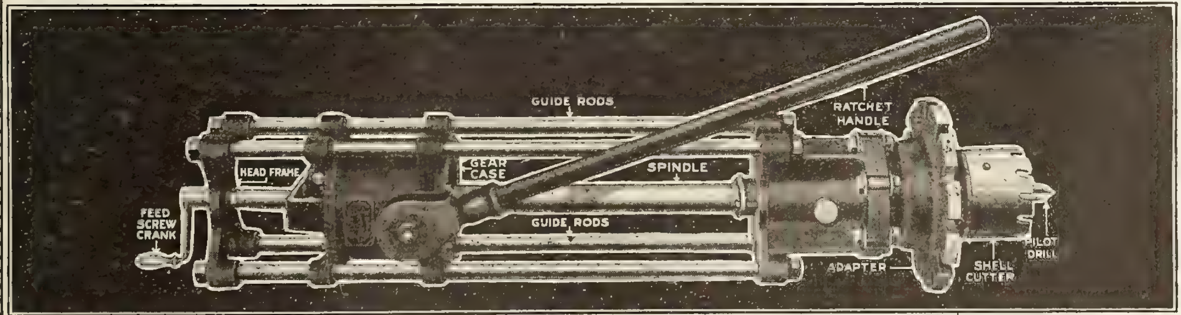
Detailed descriptions and prices on request.

H. MUELLER MFG. CO., LIMITED, SARNIA, ONT.

Water, Plumbing and Gas Brass Goods and Tools.

American Factory at Decatur, Ill., U. S. A. Branches, New York and San Francisco

Mueller Metals Co., Port Huron, Mich., Makers of "Red Tip" Brass Rod; Brass and Copper Tubing; Forgings and Castings in Brass, Bronze and Aluminum; Die Castings in White Metal and Aluminum; also Screw Machined Products.



CLASSIFIED INDEX TO ADVERTISEMENTS

The following regulations apply to all advertisers:—Eighth page, every issue, three headings; quarter page, six headings; half page, twelve headings; full page, twenty-four headings

Acid Proof Fans
Sturtevant, B. F. & Co.

Air Washers
Sturtevant, B. F. & Co.

Architect's Supplies
Geo. Vincent

Aluminum
H. Mueller Mfg. Co., Limited
Spielman Agencies Regd.

Architectural Iron
Northern Architectural Iron Works
Canada Wire & Iron Goods Co.
McGregor & McIntyre

Ash Hoists
Canada Link-Belt Co.

Asphalt
Imperial Oil Company, Ltd.

Beam Spans
Hamilton Bridge Works Co.
MacKinnon Steel Company
Sarnia Bridge Company

Bearing Metal
H. Mueller Mfg. Co., Limited

Blades
Shunk Mfg. Co.

Blast Hole Drills
Hopkins & Co., Ltd., F. H.
Mussens Limited

Blast Gates
Sturtevant, B. F. & Co.

Block (Wire and Manila Rope)
Clyde Iron Works Sales Co.
Hopkins & Co., Ltd., F. H.
Leckie Co., John

Blowers and Compressors
Canadian Ingersoll Rand Co.
Canadian Blower and Forge Co.
Sturtevant, B. F. & Co.

Boilers
Engineering & Machine Works of Canada Ltd.
Inglis Company, John
McGovern, T. J.
Mussens Limited
Waterous Engine Works Co.

Boiler Inspection
Trades Labor Branch Dept. Public Works

Books (Technical)
Walker Co., Frank A.

Boxes—Junction
Standard Underground Cable Co., of Canada Limited

Brick Dryers
Canadian Blower & Forge Co.

Brick Machinery & Supplies
Hepburn, Ltd., John T.

Brick
Don Valley Brick Co.
Harbour Brick Co.
Milton Pressed Brick Co.
York Sandstone Brick Co.

Bridges
Hamilton Bridge Works Co.
Horton Steel Works, Ltd.
Standard Steel Construction Co.

Bridges (Steel)
Canadian Des Moines Steel Co.
Hamilton Bridge Works Co.
Horton Steel Works, Ltd.
McGregor & McIntyre
MacKinnon Steel Company
Sarnia Bridge Company

Buckets
Canadian Austin Machinery
Canadian Link-Belt Co.
Canadian Mead-Morrison Co.
Hopkins & Co., Ltd., F. H.
Mussens Limited
Orton & Steinbrenner Co.

Building Materials
Britnell, Limited
Canadian Link-Belt Co.
Oakley & Sons, Geo.
Rogers Supply Co.
Standard White Lime Co.
Vitrified Clay Pipe Publicity Bureau

Building (Steel)
Standard Steel Construction Co.

Building Specialties
Drummond & Reeves Ltd.

Cable
Dominion Wire Rope Co., Ltd.
Greening Wire Co., B.
Mussens Limited
Standard Underground Cable Co., of Canada Ltd.

Cars—Steel Body
MacKinnon Steel Company
Mussens Limited

Cars—Freight
Canadian Equipment Co.

Cars Wheels
Canada Iron Foundries

Carrier Systems
Canadian Link-Belt Co.

Castings—Grey Iron
Canada Iron Foundries
Engineering & Machine Works of Canada Ltd.
Hepburn, Ltd., John T.
H. Mueller Mfg. Co., Limited

Caulking Tools
H. Mueller Mfg. Co., Limited

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Britnell, Limited

Cement Gun
Cement Gun Co.

Cement Hardener
Canada Cement Co.
Rogers Supply Co.
Spielman Agencies Regd.

Cement Waterproofing
Barrett Company, Ltd.
Dom. Tar & Chemical Co., Ltd.
Imperial Oil Company, Ltd.
Spielman Agencies Regd.

Centrifugal Pumps
Canadian Austin Machinery
Canadian Blower & Forge Co.
London Concrete Machry. Co.

Chains
Canadian Link-Belt Co.

Chemists
Canadian Inspection & Testing Laboratories

Chimneys
Horton Steel Works, Ltd.
Summerhays & Co., Wm.
Vitrified Clay Pipe Publicity Co., of Canada Ltd.

Clamshell Buckets
Canadian Austin Machinery
Orton & Steinbrenner Co.

Coaches, Passenger
Canadian Equipment Co.

Coal Crushers
Orton & Steinbrenner Co.

Coal Handling Apparatus
Canadian Austin Machinery
Canadian Link-Belt Co.
Canadian Mead-Morrison Co.
General Products Co.
Koehring Co., of Canada
Turnbull & Co., Harvard

Column Forms (Concrete)
Deslauriers Metal Products Co.

Concrete Block Machinery
London Concrete Machry. Co.

Concrete Carts
London Concrete Machry. Co

Concrete Culvert Pipes
Dominion Concrete Company

Concrete Machinery
Canadian Austin Machinery
Koehring Co., of Canada
London Concrete Machry. Co.
Mussens Limited
Wettlaufer Bros.

Concrete Mixers and Appliances
Canadian Austin Machinery
Hopkins & Co., Ltd., F. H.
Koehring Co., of Canada
Mussens Limited
Turnbull & Co., Harvard
Wettlaufer Bros.

Concrete Hardner
Spielman Agencies Regd.

Concrete Sewer Pipe
Dominion Concrete Company

Conduits
Canadian Johns-Manville Co.
Conduits Company, Limited
National Conduit Company
Vitrified Clay Pipe Publicity Bureau

Conduits (Wooden Pressure Creosoted
Pacific Coast Pipe Co.

Contractors
Anglin-Norcross, Limited
Cape & Company, E. G. M.
S. E. Dinsmore
Erie Clay Products
Gore, Nasmith & Storrie
Grant Contracting Co.
Kilmer & Barber
Lumsden Engineering & Transport Co.
MacKinnon Steel Company
McAuliffe, W. J. & Co.
McLeod, Norman Ltd.
Patterson Electric Co.
Rilett Brothers
F. W. Scriven Construction Co.
Thomson Bros.
Provincial Contracting Co.

Contractors' Bonds
United States Fidelity & Guaranty Company

Contractors' Plant & Supplies
Fuller & Johnson Mfg. Co.
Ball Engine Co.
Canadian Austin Machinery
Canadian Equipment Co.
Canadian Ingersoll Rand Co.
Canadian Link-Belt Co.
Canadian Mead-Morrison Co.
Clyde Iron Works Sales Co.
Confederation Equipment Co.
Dake Engine Co.
Dominion Road Machry. Co.
Engineering & Machine Works of Canada Ltd.
Gartshore, John J.
General Products Co.
Hamilton Bridge Works Co.
Hepburn, Ltd., John T.
Koehring Co., of Canada
London Concrete Machry. Co.
McGovern, T. J.
McDougall Co., Ltd.
Mussens Limited
Orton & Steinbrenner Co.
Osgood Company
Thew Shovel Co.
Turnbull & Co., Harvard
Webster & Trory

Conveying Appliances
Canadian Austin Machinery
Mussens Limited

Cranes, Travelling and Locomotive
Ball Engine Co.
Canadian Austin Machinery
Canadian Equipment Co.
Canadian Link-Belt Co.
Canadian Mead-Morrison Co.
Clyde Iron Works Sales Co.
Crane Limited
Erie Steam Shovel Co.
Hopkins & Co., Ltd., F. H.
Hepburn, Ltd., John T.
Koehring Co., of Canada
Mussens Limited
Orton & Steinbrenner Co.

Creosote Oils
Britnell, Limited
Dom. Tar & Chemical Co., L

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Canada Crushed Stone
Crushed Stone, Limited
Hagersville Crushed Stone Co.
Hagersville Contracting Co.
Hagersville Quarries Ltd.
Queenston Quarries Co.
Rogers Supply Co.
Standard Lime Co.
Standard White Lime Co.

Crushers (Stone and Rock)
Canadian Ingersoll Rand Co.
Dominion Road Machry. Co
Hopkins & Co., Ltd., F. H.
London Concrete Machry. Co.
Mussens Limited
Rogers Supply Co.

Cut Stone
Oakley & Sons, Geo.
Queenston Quarries Co.

Cutting Edges
Shunk Mfg. Co.

Damp Proof Coating
Barrett Company, Ltd.
Imperial Oil Company, Ltd.
Dom. Tar & Chemical Co., Ltd

Derricks and Derrick Fittings
Canadian Mead-Morrison Co.
Clyde Iron Works Sales Co.
Hepburn, Ltd., John T.
Hopkins & Co., Ltd., F. H.
Mussens Limited
Turnbull & Co., Harvard

Ditchers
Buckeye Traction Ditcher Co.
Canadian Austin Machinery
Mussens Limited

Ditching Machines
Ball Engine Co.
Buckeye Traction Ditcher Co.
Canadian Austin Machinery
Erie Steam Shovel Co.
Engineering & Machine Works o Canada Ltd.
Mussens Limited

Doors (High Grade)
Pannill Door Co.

Drafting Supplies
Geo. Vincent

Drag Line Excavators
Canadian Austin Machinery
Canadian Equipment Co.
Koehring Co., of Canada
Mussens Limited
Orton & Steinbrenner Co.

Dredging Pumps
Canadian Blower & Forge Co

Dredges
Canadian Equipment Co.
Canadian Mead-Morrison Co
Hopkins & Co., Ltd., F. H.
Mussens Limited

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Hopkins & Co., Ltd., F. H.

Duct Work
Sturtevant, B. F. & Co.

Dust Blowers
Sturtevant, B. F. & Co.

Dump Bodies
Dominion Truck Equipment C

Dump Cars, Wheels, etc.
Canadian Equipment Co.
Hopkins & Co., Ltd., F. H.
MacKinnon Steel Company
Mussens Limited

Drying Apparatus
Canadian Blower & Forge Co
Sturtevant, B. F. & Co.

Electric Fans
Sturtevant, B. F. & Co

Electric Water Systems
H. Mueller Mfg. Co., Limite

(Continued on page 8)

CRANE

Cast Iron - Brass
Cast Steel - Ferrosteel

FLANGED FITTINGS

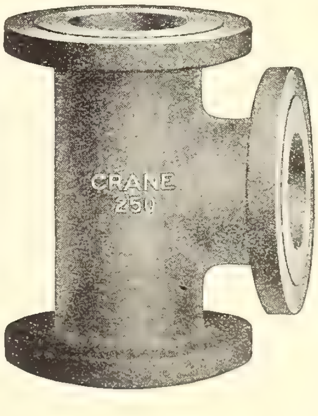
We have a large line of patterns for flanged fittings for low pressure, standard, extra heavy, hydraulic, superheated steam and extreme hydraulic pressures, ranging in size from one-inch to sixty-inch, and for working pressures from fifty pounds to three thousand pounds.

The dimensions of the low pressure, standard and extra heavy fittings are in accordance with the 1915 American Standard.

Pattern equipment for standard sizes and shapes is such that absolutely uniform castings are obtained.

Castings for special fittings also may be made at a minimum expense owing to our large equipment of special patterns which may be altered at very low cost.

Manufacturers of Valves, Fittings and Piping Equipment and Distributors of Pipe, Plumbing and Heating Supplies.



Branches and Warehouses:
HALIFAX, OTTAWA, TORONTO,
HAMILTON, LONDON, WINNIPEG,
REGINA, CALGARY, VANCOUVER.

Sales Offices:
ST.JOHN,NB.,QUEBEC,SHERBROOKE
EDMONTON, VICTORIA,
SYDNEY, AUSTRALIA.

CRANE
LIMITED

General Office & Exhibit Rooms
386 BEAVER HALL SQUARE
MONTREAL
Works
1280 ST. PATRICK ST.
MONTREAL

CRANE-BENNETT
LIMITED
Head Office and Warehouse:
LONDON, ENGLAND.

Sales Offices:
BIRMINGHAM, CARDIFF,
GLASGOW, LEEDS, MANCHESTER.

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CLASSIFIED INDEX TO ADVERTISEMENTS—Continued

Electrical Specialties
Spielman Agencies Regd

Elevator Doors
Ormsby Company, A. B.

Elevators
Canadian Link Belt Co
Otis-Fensom Elevator Co.
Turnbull Elevator Company

Enameled Brick
American Enameled Brick & Tile Company

Engines
Canadian Blower & Forge Co.
Canadian Ingersoll Rand Co.
Clyde Iron Works Sales Co.
Fuller & Johnson Mfg. Co.
Hopkins & Co., Ltd., F. H.
Inglis Co., John
Laurie & Lamb
Le Roy Company
Sterling Engine Co.
Waterous Engine Works Co.

Engines—Swinging
Canadian Mead-Morrison Co.
Clyde Iron Works Sales Co.

Engines (Civil and Mechanical)
Chipman & Power
Hunt & Co., Robt. W.
Milton Hersey Company
Lea, R. S. & W. S.

Engineers' Supplies
Geo. Vincent

Excavators
Ball Engine Co.
Buckeye Traction Ditcher Co.
Canadian Austin Machinery
Canadian Equipment Co.
Canadian Mead-Morrison Co.
Clyde Iron Works Sales Co.
Engineering & Machine Works of Canada Ltd.
Erie Steam Shovel Co.
Hopkins & Co., Ltd., F. H.
Koehring Co., of Canada
Lumsden Engineering & Contracting Co.
Monighan Machine Co.
Mussens Limited
Thew Shovel Co.

Exhausters
Sturtevant, B. F. & Co.

Exhaust Heads
Canadian Blower & Forge Co.
Sturtevant, B. F. & Co.

Fans
Canadian Blower & Forge Co.

Fans, Disc
Sturtevant, B. F. & Co.

Fans, Multivane
Sturtevant, B. F. & Co.

Fans, Propeller
Sturtevant, B. F. & Co.

Fans, Silentvane
Sturtevant, B. F. & Co.

Fibre Board
Chew, Manley

Filters, Water
Laurie & Lamb

Fireproofing
National Fireproofing Co.

Fireproof Doors and Windows
Mussens Limited
Ormsby Company, A. B.

Fire Escapes
Canadian Des Moines Steel Co.
McGregor & McIntyre
Dennis Wire & Iron Works Co.
Northern Architectural Iron

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Crane Limited
H. Mueller Mfg. Co., Limited
York Manufacturing Co.

Fixing Devices
Inventions Limited
Rawplug Co., of Canada

Flag Poles
MacKinnon Steel Company
McGregor & McIntyre

Floor Clips
Western Steel Products Limited

Flooring Materials
Imperial Oil Company, Ltd.
National Fireproofing Co.
Vitrified Clay Pipe Publicity Bureau

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Canadian Blower & Forge Co.

Furnaces
H. Mueller Mfg. Co., Limited

Gantry and Cantilever Cranes
Orton & Steinbrenner Co.

Gasoline Engines
London Concrete Machry. Co.

Gears (Cut)
Hamilton Gear & Machine Co.

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Consolidated Plate Glass Co.

Grader Blades
Shunk Mfg. Co.

Gravel
Allen Bros.
Paris Sand & Gravel Co.
Rogers Supply Co.

Gymnasium Apparatus
Coffey, J. G.

Hardware
Hardware Co., of Toronto

Hardwood Flooring
Eaton & Sons, J. R.

Hauling Contractors
Angstrom & Verochio
Lumsden Engineering & Transport Co.

Heating Apparatus
Canadian Blower & Forge Co.
Crane, Limited
Sturtevant, B. F. & Co.

Hoists, Electric
Canadian Austin Machinery
Canadian Link-Belt Co.
Clyde Iron Works Sales Co.

Hoists (Truck)
Dominion Truck Equipment Co.

Hoisting Apparatus
Canadian Austin Machinery
Canadian Ingersoll Rand Co.
Canadian Mead-Morrison Co.
Clyde Iron Works Sales Co.
Hopkins & Co., Ltd., F. H.
London Concrete Machry. Co.
Mussens Limited

Hoisting Engines
Hamilton Co., Wm.
Canadian Mead-Morrison Co.
Clyde Iron Works Sales Co.
General Products Co.
Hopkins & Co., Ltd., F. H.
Koehring Co., of Canada
London Concrete Machry. Co.
McGovern, T. J.
Mussens Limited
Turnbull & Co., Harvard

Hydrants
Canada Iron Foundries
Dominion Steel Products Ltd.
Kerr Engine Company
Gartshore-Thompson Pipe Co.
McAvity & Sons, T.
Hepburn, Ltd., John T.

Hydrated Lime
Melville Quarry Co.
Standard Lime Co.

Ice Making Machinery
Canadian Ingersoll Rand Co.
York Manufacturing Co.

Industrial Cars
Canadian Austin Machinery
Canadian Equipment Co.
Hopkins & Co., Ltd., F. H.
MacKinnon Steel Company
Mussens Limited

Inspection Engineers
Canadian Inspection & Testing Laboratories
Hunt & Co., Robt. W.
Milton Hersey Company

Insulating Compounds
Dom. Tar & Chemical Co., Ltd.
Imperial Oil Company, Ltd.
Spielman Agencies Regd.
Standard Underground Cable Co., of Canada Ltd.

Jib Cranes (all kinds)
Hamilton Bridge Works Co.

Joist Hangers
Hamilton Bridge Works Co.

Kilns
Canadian Blower & Forge Co.
Horton Steel Works, Ltd.
MacKinnon Steel Company

Lead Pencils
American Lead Pencil Co.

Lime
Standard Lime Co.

Limestone
Deschambault Quarry Sorpn.

Hydrated Lime
Standard White Lime Co.

Lockers (Clothes)
Canada Wire & Iron Goods Co.

Locomotive Cranes
Ball Engine Co.
Canadian Austin Machinery
Canadian Equipment Co.
Canadian Link-Belt Co.
Erie Steam Shovel Co.
General Products Co.
Hopkins & Co., Ltd., F. H.
Koehring Co., of Canada
McGovern, T. J.
Mussens Limited
Orton & Steinbrenner Co.

Locomotive Steam
Canadian Equipment Co.

Locomotive Gasoline and Storage Battery
Canadian Austin Machinery
Fate-Root-Heath Co.
Koehring Co., of Canada

Marble
Oakley & Sons, Geo.

Metal Lath
General Products Co.
Ormsby Company, A. B.

Meters
Builders Iron Foundry

Mine Cars
Philip Gies Foundry

Motors
Lincoln Electric Co., of Canada Ltd.
Sturtevant, B. F. & Co.

Oil Tanks
Canadian Des Moines Steel Co.
Hamilton Bridge Works Co.
Hamilton Co., Wm.
Horton Steel Works, Ltd.
MacKinnon Steel Company

Orange Peel Buckets
Orton & Steinbrenner Co.

Ornamental Iron
Dennis Wire & Iron Works Co.

Ornamental Moulds
London Concrete Machry. Co.

Paint (Heated Surfaces)
Barrett Company, Ltd.
Spielman Agencies Regd.

Paints and Varnishes
Hopkins & Co., Ltd., F. H.
Spielman Agencies Regd.

Paints (Bridge and Structural Iron and Pipe Coating)
Britnell, Limited
Canada Paint Co.
Dom. Tar & Chemical Co., Ltd.
Imperial Oil Company, Ltd.
Spielman Agencies Regd.

Paving and Paving Materials
Barrett Company, Ltd.
Dom. Tar & Chemical Co., L
Imperial Oil Company, Ltd.
Lumsden Engineering & Contracting Co.
Standard Lime Co.
Pacific Coast Pipe Co.
Vancouver Wood Pipe & Tank Company

Pencils((Lead)
American Lead Pencil Co.

Penstocks (Wood Stave)
Hamilton Bridge Works Co.
Pacific Coast Pipe Co.

Perforated Metals
Canada Iron & Wire Works

Pile Driving Machinery
Canadian Mead-Morrison Co.
Clyde Iron Works
Hopkins & Co., Ltd., F. H.
Mussens Limited

Pipe (Concrete, Iron & Wood)
Canada Iron Foundries
Canadian Pipe Co.
Dominion Concrete Company
Gartshore, Thompson Pipe Co.
National Iron Corporation

Pipe Covering (Cold and Steam)
Canadian Johns-Manville Co.

Pipe and Tapping Machines
H. Mueller Mfg. Co., Limited

Pitch
Dom. Tar & Chemical Co., Ltd

Planing Mill Exhausters
Canadian Blower & Forge Co.

Plaster
Britnell & Company
De Giorgio, Limited

Plastering
Hynes Co., W. J.

Pneumatic Machinery
Laurie & Lamb

Power Engines
Inglis Co., John

Prisms
Luxfer Prism Co.

Propeller Fans
Sturtevant, B. F. & Co.

Pumps and Pumping Machinery
Canadian Blower & Forge Co.
Canadian Ingersoll Rand Co.
Canadian Mead-Morrison Co.
Cook, A. D.
Fuller & Johnson Mfg. Co.
General Products Co.
Goldie & McCulloch Co.
Hepburn, Ltd., John T.
H. Mueller Mfg. Co., Limited
Hopkins & Co., Ltd., F. H.
Inglis Co., John
Koehring Co., of Canada
London Concrete Machry. Co.
McDougall Co., Ltd.
Mussens Limited
Waterous Engine Works Co.

Quarry Machinery
Hopkins & Co., Ltd., F. H.
McGovern, T. J.
Mussens Limited

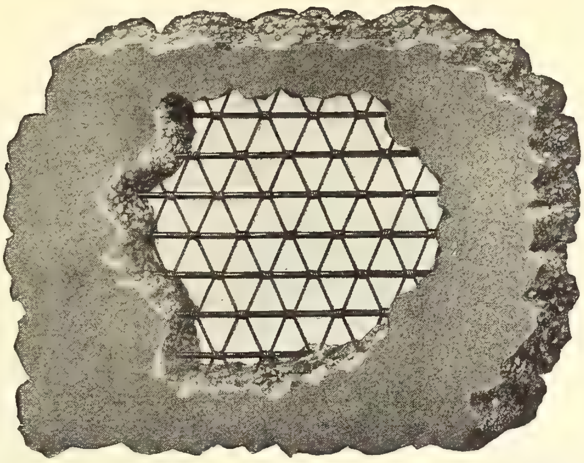
Radiators (Steam Taps)
Canadian Johns-Manville Co.

Rails
Gartshore, John J.
Hopkins & Co., Ltd., F. H.
Mussens Limited

(Continued on page 10)

Concrete Roads Must be Reinforced
with
Triangular Mesh Reinforcement

Engineers select materials entering into any class of construction for the service those materials are to perform. Selection is based upon known characteristics or properties.



The Reinforcement of Concrete with Steel Fabric

Glass is selected to admit light but not to resist impact. Characteristic qualities of a material fit it only for certain services.

A concrete tower, or building, or bridge, or ship, is invariably reinforced with steel fabric. A concrete highway must be steel reinforced for the same reason.

A concrete highway has to stand more than almost any other form of construction, because of the heavy motor traffic, abrasion and frost. It is equal to the heaviest work by reinforcing with steel.

The upheaval of frost is the concrete road's worst enemy. Both sides rise with the frost in the fall and lower with the thaw in the spring, making a great hinge of the centre. The steel reinforcement holds the road against all cracks.

Manufactured in Canada by

The Canadian Steel and Wire Company
Limited
Hamilton, Canada

CLASSIFIED INDEX TO ADVERTISEMENTS—Continued

Railway Supplies
Gartshore, John J
Hopkins & Co., Ltd., F. H.

Reinforcements, Concrete & Steel
Burlington Steel Company
Canada Iron & Wire Works
Canadian Steel & Wire Co.

Reinforcement Ties
Bates Valve Bag Co.

Refrigeration Machinery
Canadian Johns-Manville Co.
York Manufacturing Co.

Rigging Screws
Hopkins & Co., Ltd., F. H.

Riveted Spans
MacKinnon Steel Company

Road Drags
Sarnia Bridge Company

Road Asphalt
Imperial Oil Company, Ltd.

Road Machinery
Barford & Perkins
Canadian Austin Machinery
Can. Fairbanks-Morse Co., Ltd.
Dominion Road Machry. Co.
Hopkins & Co., Ltd., F. H.
Koehring Co., of Canada
McGovern, T. J.
Mussens Limited
Waterous Engine Works Co.
Sauerman Bros.

Road Materials
Barrett Company, Ltd.
Dom. Tar & Chemical Co., Ltd.

Road Oil
Barrett Company, Ltd.
Imperial Oil Company, Ltd.

Road Tar
Barrett Company, Ltd.
Dom. Tar & Chemical Co., Ltd.

Roofing Contractors
A. W. Carmichael Ltd.

Roofing Cement
Barrett Company, Ltd.
Dom. Tar & Chemical Co., Ltd.

Roofing Material
Barrett Company, Ltd.
Brantford Roofing Co.
Canadian Johns-Manville Co.
Dom. Tar & Chemical Co., Ltd.
Imperial Oil Company, Ltd.
Vitrified Clay Pipe Publicity Bureau

Rope
Leckie Co., John

Rolling Steel Doors
Ormsby Company, A. B.

Rubble Stone
Queenston Quarries Co.

Sand
Allen Bros.
Paris Sand & Gravel Co.
Rogers Supply Co.
Standard Lime Co.

Screens
Canada Wire & Iron Goods Co.

Screw Plugs
Rawplug Co., of Canada
Inventions, Limited

Sewer Cleaning Machines
Turbine Sewer Machine Co.

Sewer Manholes
Philip Gies Foundry

Sewer Pipe
Britnell & Company
National Iron Works
Vitrified Clay Pipe Publicity Bureau

Sheathing
Barrett Company, Ltd.

Shingle Stain Oil
Barrett Company, Ltd.
Dom. Tar & Chemical Co., Ltd.

Shovels (Steam)
Ball Engine Co.
Canadian Austin Machinery
Canadian Equipment Co.
Canadian Mead-Morrison Co.
Erie Steam Shovel Co.
Hopkins & Co., Ltd., F. H.
McGovern, T. J.
Mussens Limited
Osgood Company
Thew Shovel Co.

Sidewalk Doors
McGregor & McIntyre

Silo Material
National Fireproofing Co.

Silo Moulds
London Concrete Machry. Co.

Smoke Stacks
Canadian Blower & Forge Co.
Hamilton Bridge Works Co.
Horton Steel Works, Ltd.
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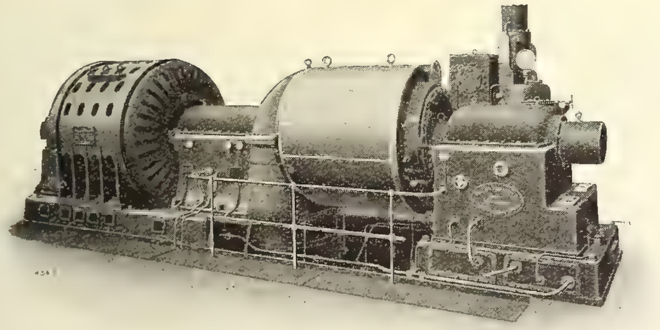

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BELLISS & MORCOM LTD.
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AIR COMPRESSORS CONDENSERS
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operated by Oil Engines

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Agents—

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In Every Industrial Scene—

Almost without exception, whenever you see an illustration of a group of modern industrial buildings, you will find, somewhere in the picture, an elevated steel tank. If you knew the signs, you would recognize many of them as Canadian Des Moines Tanks.

This fact is significant in that it shows how well recognized is the principle of which Canadian Des Moines Tanks are the concrete embodiment. The leaders of industry know the importance of protecting their plants by a liberal supply of water at the right pressure. Fire isn't the only use for this water, for most every industrial process calls for the use of water at some step in the operation.

How about your plant? Canadian Des Moines Tanks may offer the solution to your vexing water supply problem. Consult with our organization; we will be glad to submit bids and specifications upon request.

Write for pamphlet No. 67.

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Canadian Des Moines Steel Co.
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267 Inshes Avenue — Chatham, Ont.
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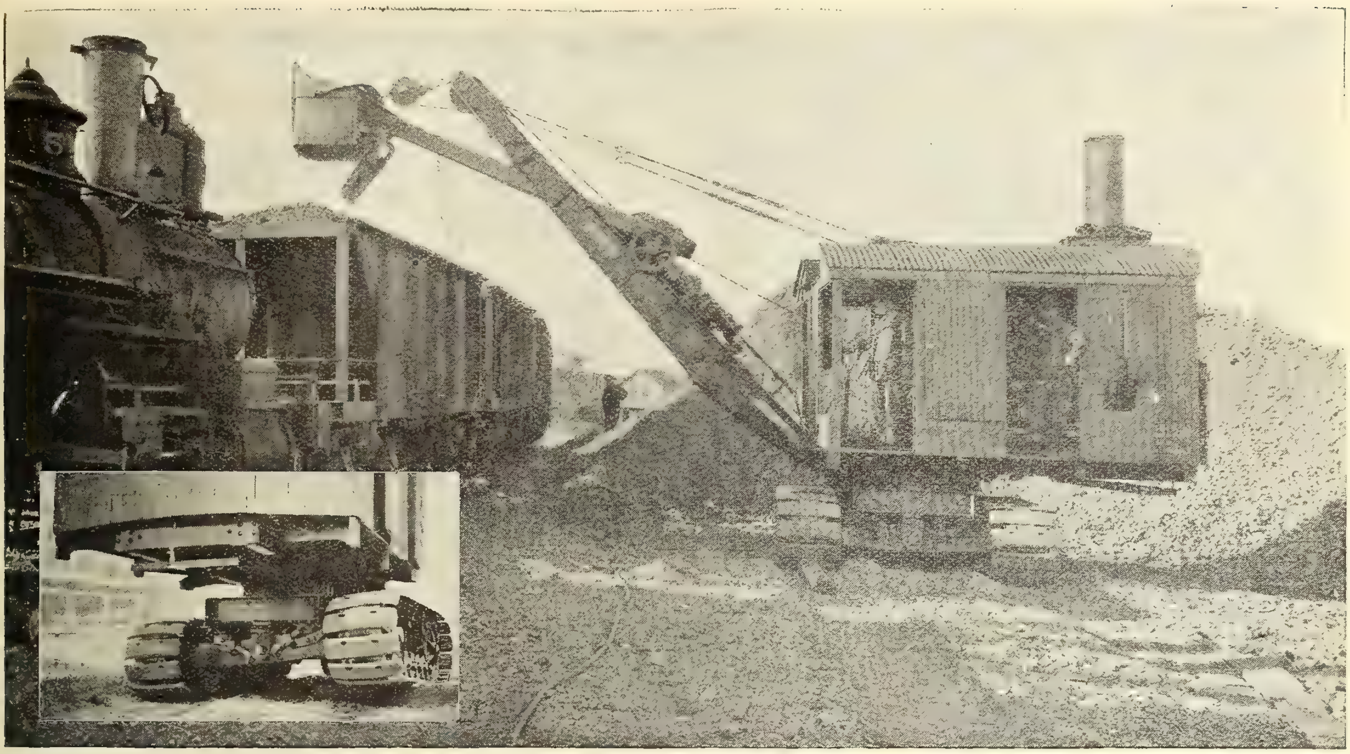


Upholding the Business End

The best boom that can be designed, backed by the most efficient engines and operating mechanism must be mounted on the right truck if your shovel is to accomplish all you expect it to.

Compare other continuous treads with the Thew. You will want to pay special attention to three features, the power steer, the two speeds and the flexibility.

The Thew power steer is operated by the man in the cab. He simply kicks a foot lever, swings the boom a little and follows it around. No chains to hook up. No steam lines to connect. Quick, easy and effective.

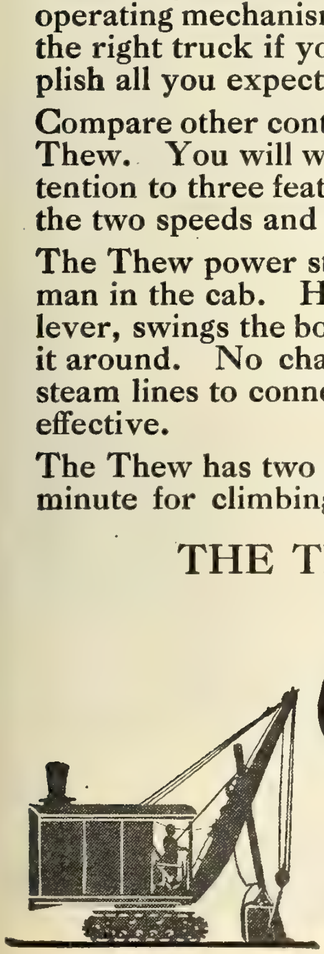
The Thew has two speeds. One of 42′ a minute for climbing, soft earth, mud or tough going of any sort. One of 65′ a minute for level traveling and easy going. At low speed the Thew moves through or over anything and has been known to negotiate a 40% grade under its own power. All gears beneath the truck have steel covers.

The Thew combines the good points of flexible and rigid designs without the evils of either. A swivel device on the front axle and tread frames keeps the traction even and uniform and the house level even when one tread is going over a timber, rock or other obstacle.

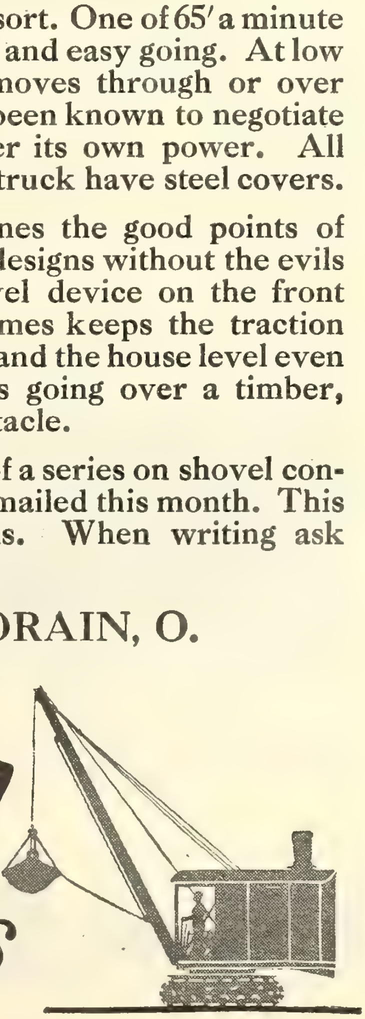
The third folder of a series on shovel construction is being mailed this month. This one covers trucks. When writing ask for 323.

THE THEW SHOVEL COMPANY, LORAIN, O.

EXPORT DEPARTMENT
ALLIED MACHINERY COMPANY OF AMERICA



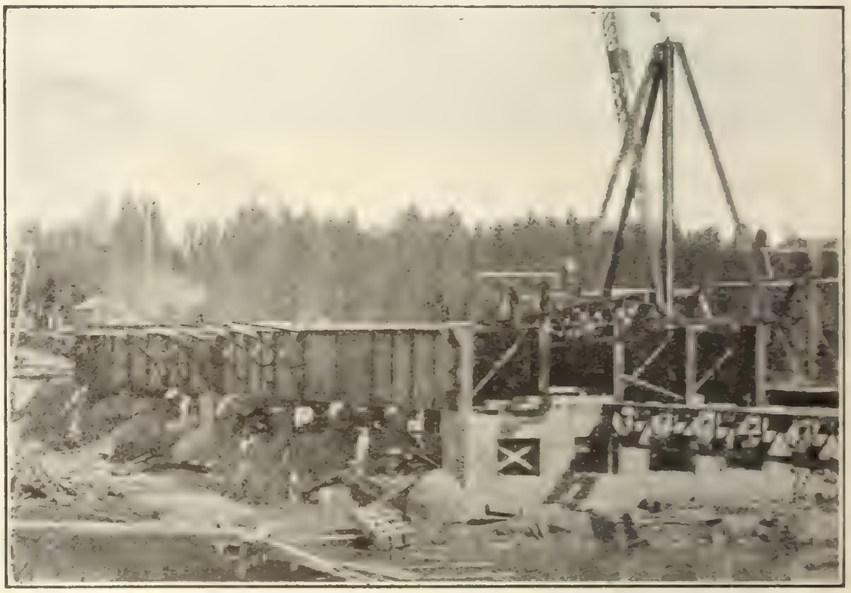
Thew
Power Shovels



Architectural Treatment
for
Structural Steel Bridges
combines Art, Economy and
Permanence -

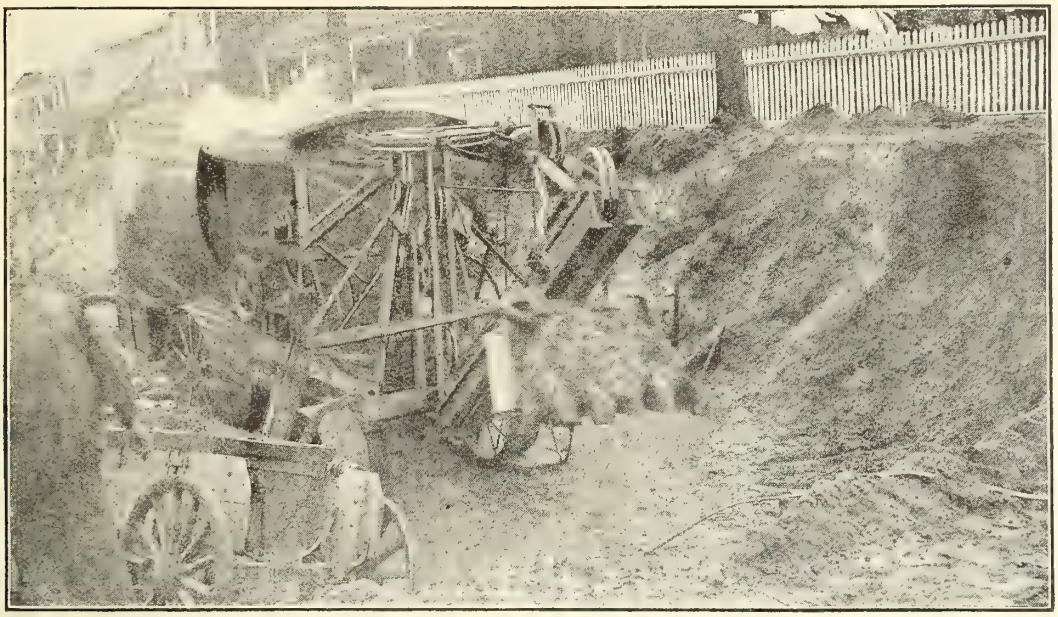
BRIDGE
OVER BOW RIVER
BANFF, ALBERTA

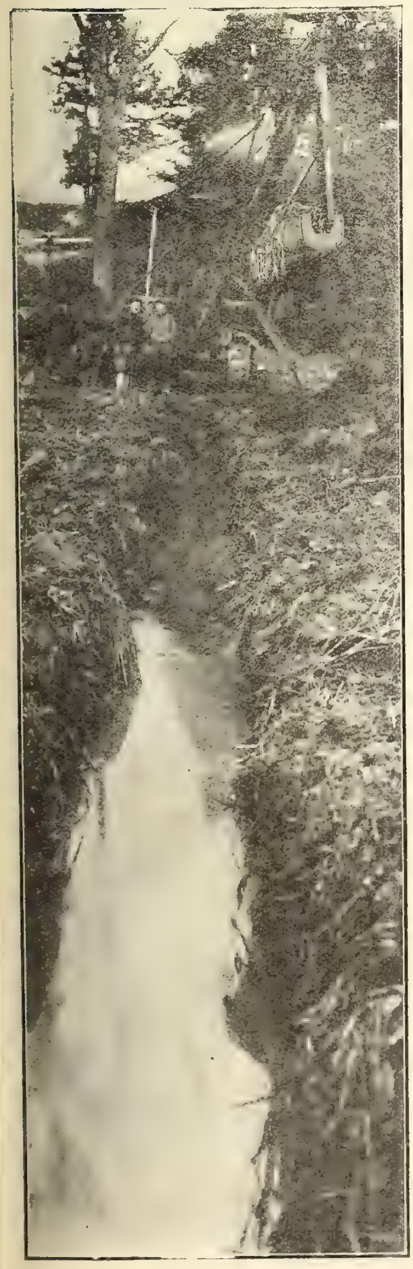
THIS type of bridge is among the recent developments in *structural steel*. It consists of steel plate girders encased in concrete.



BUILD WITH
STRUCTURAL STEEL

Issued by the
Structural Steel Association





Let us help you make some money this season

Road grading at the rate of 400 yards per day with a Keystone and its Skimmer Scoop, with a crew of three men, certainly opens up many possibilities for you to put in low-priced bids for work, yet clean up nice profits for yourself. Others have done it—why not you?

Keystone Excavator

Model 4'23

Here you have an Excavator, weighing approximately 12 tons, operated by steam, and travelling under its own power, which with different scoops, can be used for any earth or material digging and moving job that you can put it to. For road work with Skimmer Scoop it is unbeatable. For ditching or excavation work, using Ditcher Scoop in place of Skimmer, the machine stays on the level, and backs up, taking the excavation with it—capacity 150 to 300 cubic yards per day. The working boom gives a lateral working radius of 28 feet—digs down to 16 feet—the boom swinging, not the excavator itself. Made in Canada and sold at a very moderate price.

Illustration at top shows a typical rough road grading job in Toronto—the kind the Keystone likes. At left notice a fine Keystone ditching job in Oshawa. Write for Keystone Booklet today.

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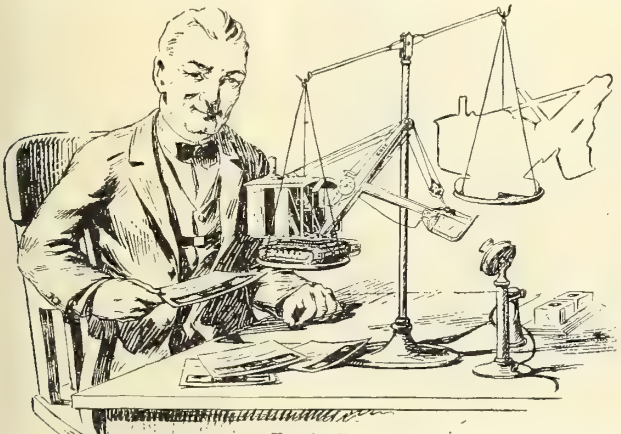
A doubtful contractor sent a wire:

J. J. Thomson, Omaha, Nebr.—Understand you have used ERIE and other steam shovels. Please telegraph collect which Shovel you prefer and why.



Erie's Reliability decides, beyond any doubt. Nearly all of the wires advised buying an Erie for steady service—and steady service was just what he wanted to be sure of.

> These prominent firms have tried various makes of steam shovels, and now standardize on the Erie.

and Farr Bros. Co., Chicago, Ill., answered:

In our opinion the Erie is more reliable and economical.—Farr Bros. Co., Chicago, Ill. (Owners of 2 Eries.

and R. B. Oliver, Little Rock, Ark., answered:

Prefer Erie Shovel account low repair cost and consistent work. Consider Erie best revolving shovel on market.—R. B. Oliver, Little Rock, Ark. (Own 5 Eries)

and Clement F. Sculley Co., St. Paul, Minn., answered:

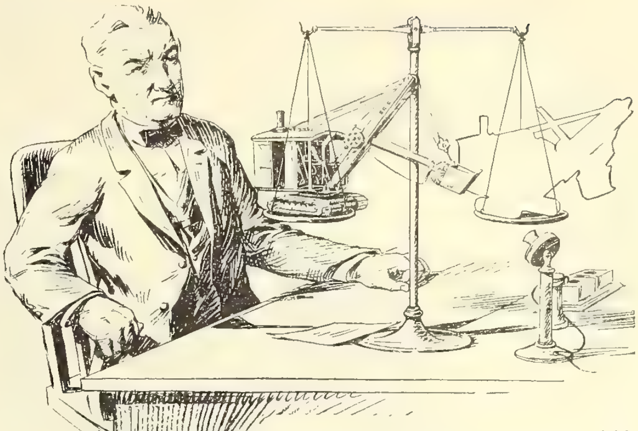
Have operated and owned five different types of revolving shovels. Only one reason for my owning three Eries. Can make more money with less grief.—Clement F. Sculley Co., St. Paul, Minn.

and J. L. Shiely, St. Paul, Minn., answered:

Have used both shovels; the Erie is far superior.—J. L. Shiely, St. Paul, Minn. (Own 2 Eries)

and Kahl Bros. Constr. Co., Cleveland, Ohio, and Davenport, Iowa, answered:

We prefer Erie Shovel account faster loading and cheaper upkeep.—Kahl Bros. Constr. Co., Cleveland, Ohio. (Own 4 Eries)



Weighing them in the balance: This contractor was undecided about which shovel to buy, before he sent out wires asking experienced shovel owners.

and J. J. Thomson

of the Thomson Co., prominent Omaha Contractors,

answered:

Prefer the ERIE account of less repair expense less upkeep and delays—J. J. Thomson, Omaha, Nebr.

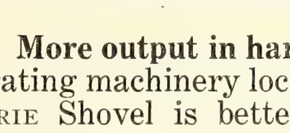
If you believe that the biggest thing about any piece of construction machinery is its ability to work along month after month, without tying up the job—then the shovel that you want is an Erie. If you believe that is most important to get the steam shovel that **loses least time**, you want an Erie.

More output in hard digging: With all of its operating machinery located back of the centre pin, the Erie Shovel is better counter-balanced, and puts more of its power to actual use. In hard digging an Erie always give you more output **from the very first day**—and in a month's or a season's service does FAR more work, because it keeps on running steadily.

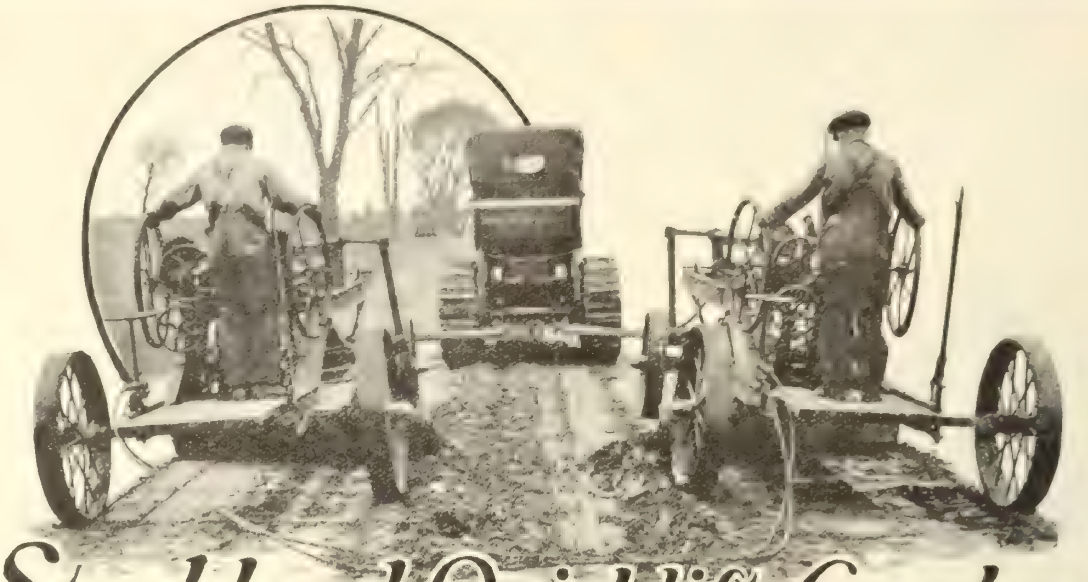
The fact is well known by the majority of excavating contractors. There are thousands of contractors ready to send you telegrams like those quoted at the left. Wire some, and see!

ERIE STEAM SHOVEL CO., Erie, Pa., U.S.A.
Incorporated 1883, formerly BALL ENGINE CO.
Builders of Eire Steam Shovels, Locomotive Cranes, Railway Ditchers

Export Dept.:
GASTON & COMPANY, INC.
165 Broadway, New York



ERIE Revolving Shovels



Stockland Quicklift Graders are bought on Performance

Successful contractors, highway engineers and officials are inclined to look beneath the paint—behind the design—back of the reputation—at the actual *materials, construction,* and *performance* of the machine in service.

Buying on performance is the safe method—it eliminates many a disappointment. It re-assures satisfaction. It avoids the guess-work and disillusionments that frequently follow "high pressure sale."

Stockland Graders are being bought in constantly increasing numbers—***on performance.***

Any of the 51 Stockland distributors will gladly tell you where and when you can see a Stockland Quicklift Grader in operation, on actual road work, handled by its regular operator Then ***you*** can buy on *performance.*

Write for Stockland 1923 literature today.

THE STOCKLAND MOVES MORE EARTH WITH LESS POWER

Not just a claim — but a demonstrable fact, backed by actual grading records.

The Stockland blade is a ***cutting edge*** which cuts ***under*** the earth. Certainly this makes less demand upon power than ***scraping.***

The earth is then ***rolled*** to one side ***not pushed***—by the ***scientifically curved*** Stockland Moldboard.

Instead of ***carrying*** the earth in front of the moldboard the ***power*** is devoted to ***cutting and rolling***—actual earth moving

Because the Stockland blade ***cuts*** it is drawn ***down and into*** the cut—it cannot drop into soft places or scrape and chatter over the hard spots. This gives a clean, uniform, once-over cut. You can verify the reasonableness of this important advantage by asking your dealer about Stockland Quicklift Graders.

Stockland

Stockland Road Machinery Co. Making Better Roads Cheaper

ROAD MACHINERY CO ~ MINNEAPOLIS

2701 34th Ave. South

MUSSENS M LIMITED

AN AUTO-CRANE ON YOUR JOB IS A HANDY PIECE OF EQUIPMENT

For Clam Shell or as an ordinary derrick, for excavating, loading or unloading cars of material

BYERS CRANES

Half-Circle
or
Full Revolve
on Car Wheels,
Road Wheels
or Caterpillar
Traction

Steam, Gas or
Electric Power

½yd-¾yd-1yd

Send for particulars

We have a Complete Line of Road and Excavating Machinery
SMITH MIXERS - MARSH HOISTS - INSLEY CHUTING
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MUSSENS M LIMITED

Western Dump Cars in Road Work

Heavy Road Grading in Minnesota

The heavy cuts and fills necessary in modern road construction justify the use of small Western Dump Cars where the haul is too long to be made economically with dump wagons.

The size of dump car depends on local conditions —never more than 4 to 5-yd. capacity; the make should be **Western** every time, for the simple reason that Western Dump Cars permit greater production with less cost of maintenance than other dump cars. They will OUTWORK and OUTLAST any other dump cars on the market.

Our experienced road engineers will be glad to analyze your road contract and advise, entirely without obligation on your part.

Send for our new catalogue of Contractor's Equipment, J No. 57.

Western

That's Why

MUSSENS LIMITED

Montreal Toronto Winnipeg Vancouver

MUSSENS M LIMITED

"It has proven to be the best Machine that I have had on my work"

—D. E. COLEMAN, President, J. C. Coleman & Sons Co., Boston.

3/4-yard Revolving Shovel

Here is what Mr. Coleman said about this Shovel:

"It has proven itself to be the best machine that I have had on my work and will handle a greater yardage. As an illustration let me call your attention to the fact that one day last week this machine loaded seven 7-yard trucks in 14 minutes and could have continued throughout the day at this rate had we been able to keep the trucks to the shovel, although we had 15 trucks to this one machine. The haul was of considerable length which necessitated some idleness on the part of the shovel. It is my belief this shovel could have loaded from 1200 to 1400 yards that day had it had the trucks to load."

Send for Bulletin C-201-D

BUCYRUS

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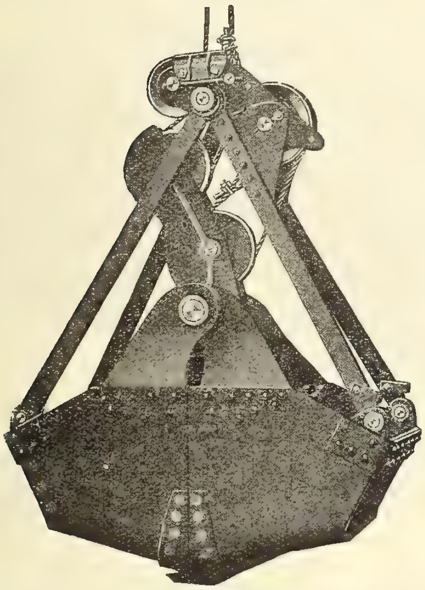

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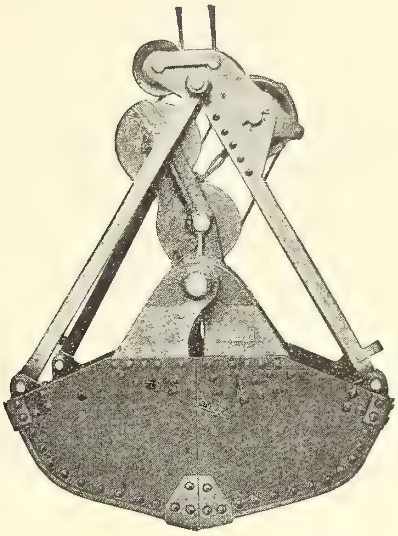

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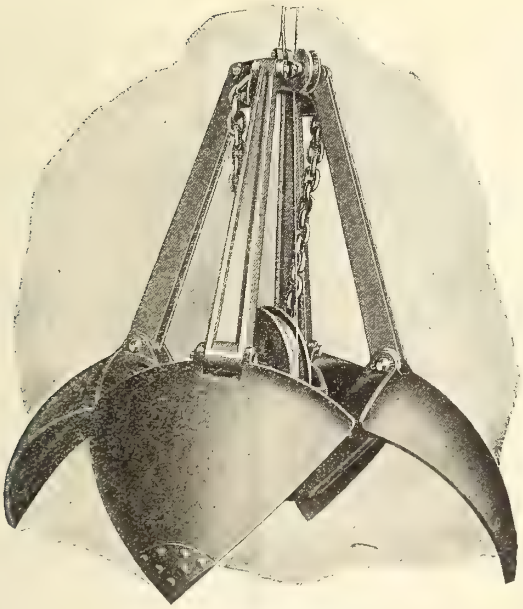

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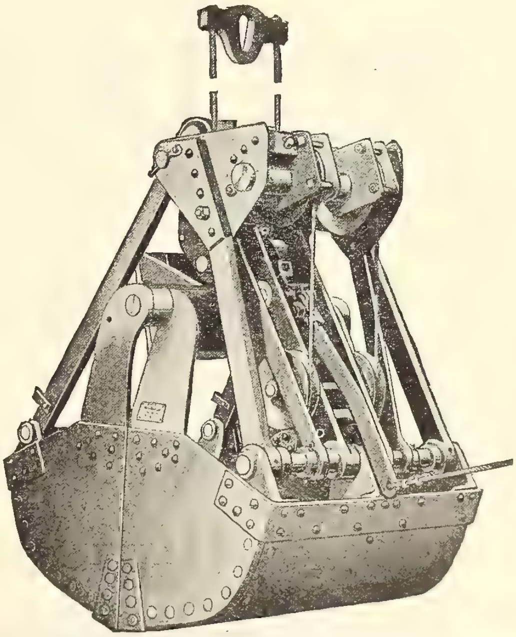

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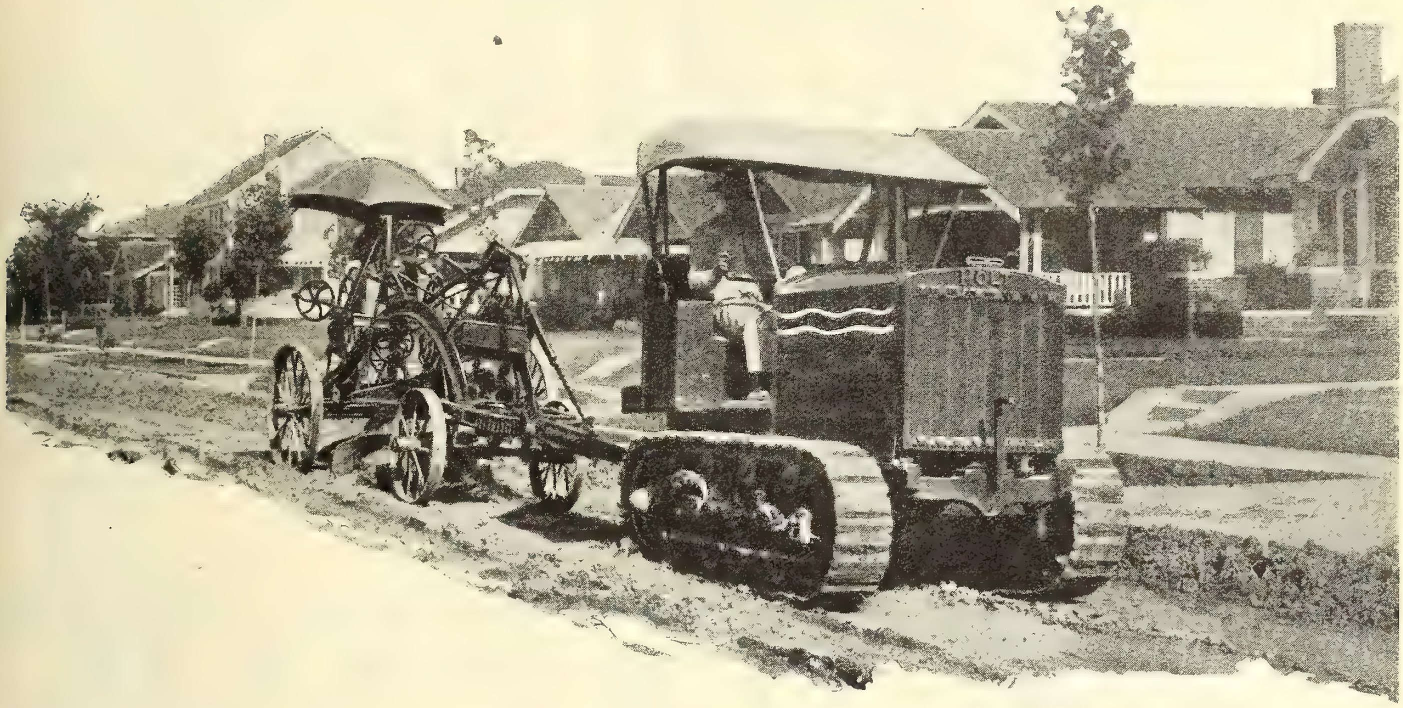

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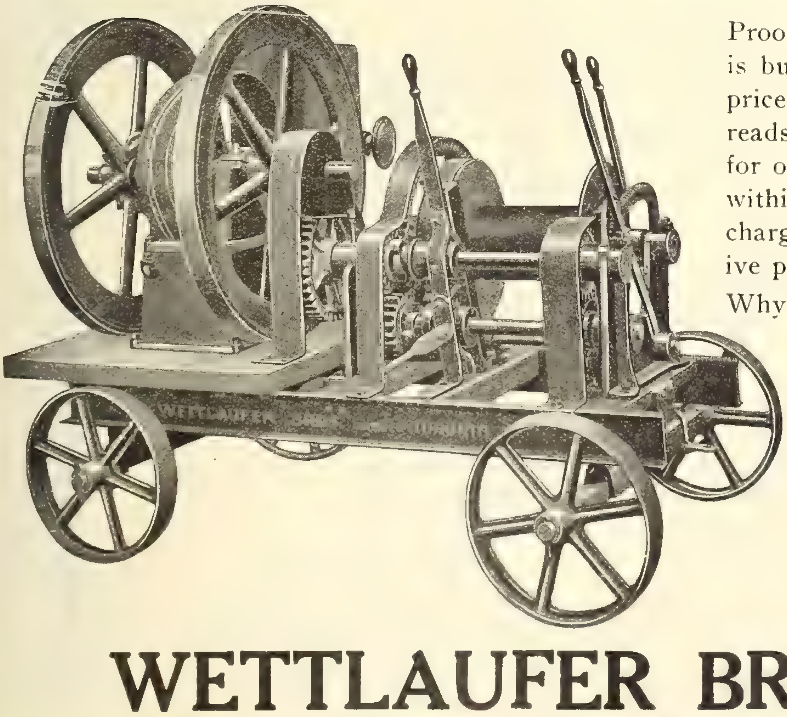

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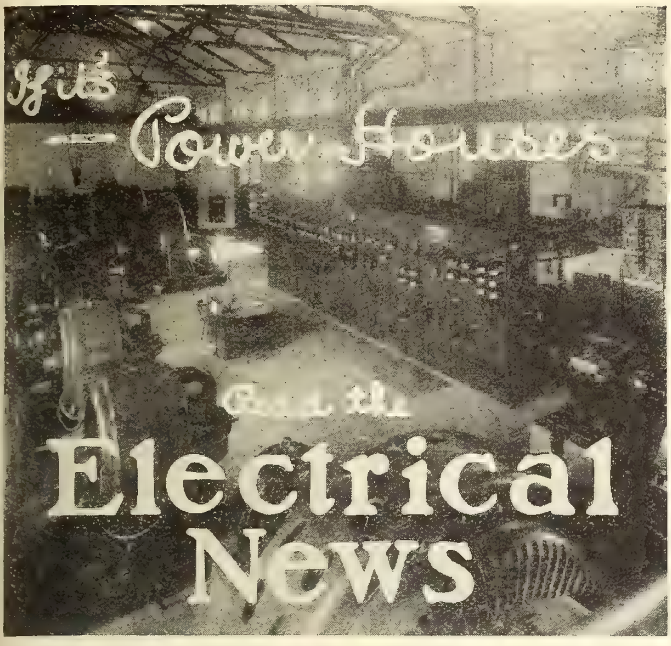

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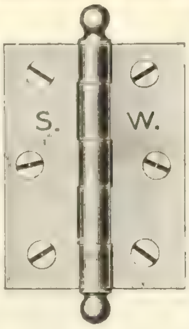

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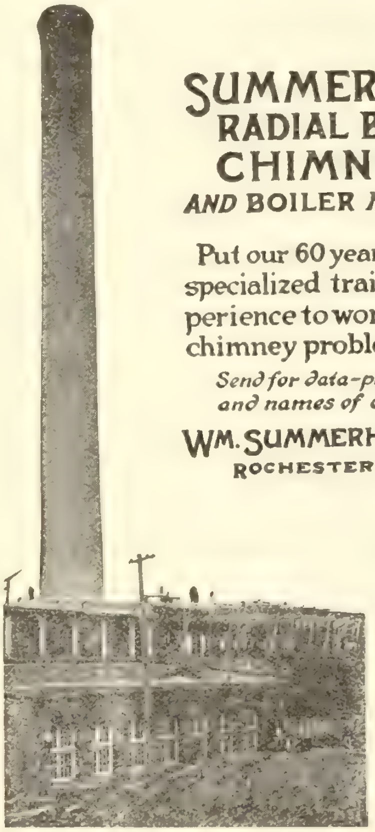

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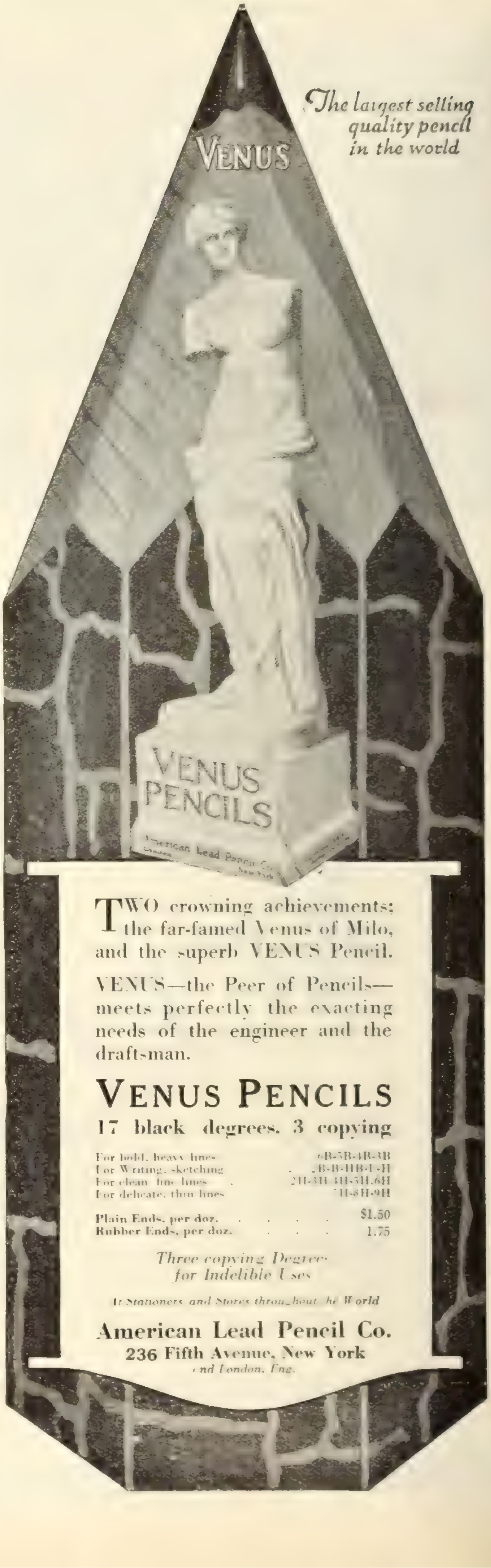
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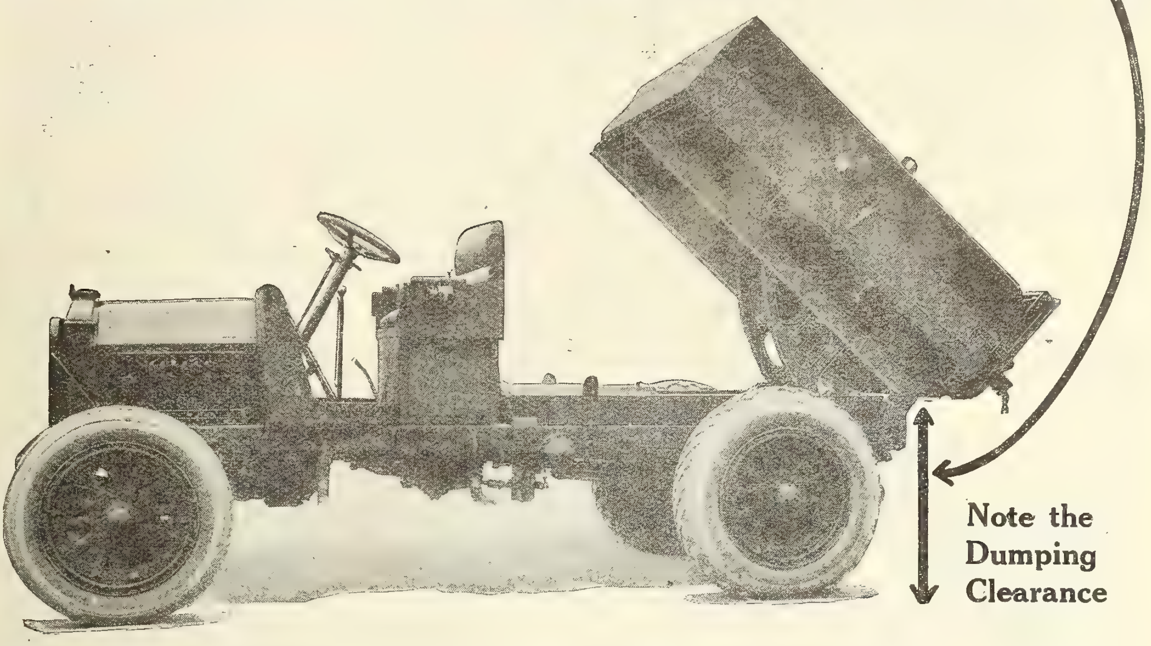

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An Adequate Apprenticeship System Will Help to Remedy Labor Troubles

Newspaper reports indicate that large numbers of skilled mechanics are daily leaving Canada to take up work in the United States, where wages are said to be considerably higher than here. The extreme scarcity of skilled labor over there makes such a situation possible, but the unfortunate feature of the emigration is that it only aggravates inadequate labor supply of this country and takes from here mechanics that are badly needed for our industries. Thus a condition is arising whereby wages will become inflated and costs will go up, creating a false situation that will ultimately lead to a curbing of purchases and a stifling of industry until once more prices drop within the scope of the buying power of the public.

This effect is already evident in the building industry. Costs are going up and if labor carries out its proposal to boost wages, the cost of construction will once more ascend to a scale which the purchasers of construction will refuse to meet. Thus the building boom that last year gave some indication of being of substantial fabric will turn out to be nothing but a bubble that will burst and disappear at the least uncertain ripple. Should building show signs of slackening before the season is far advanced, the blame can be laid on a condition that has permitted labor to acquire inflated wages, that condition being the scarcity of skilled mechanics.

"Financial Post" has a very striking example of what this scarcity can lead to in a recent editorial which is quoted here because it illustrates the point we have in mind.

> "During the recent snow storm, when the Toronto streets were being cleared, drivers were to be seen loafing at sixty cents an hour on their vehicles until leisurely shovellers completed their loading task at sixty cents an hour. No driver as he smoked thought of assisting a shoveller. In fact, one driver climbed down and as he lighted his pipe, conversed with a shoveller who desisted in his leisurely efforts. Here was labor worth about 30 cents or 40 cents an hour, being loafed away at the rate of $1.20 per hour, while the horses for the time of which the city also paid stood idle.
>
> "This incident is here described not as a further argument against municipal wastefulness and inefficiency alone, as indicative of a weakness in the whole industrial fabric. It is not so much a question of high wages—ridiculously high in the case referred to—as the fact that these high wages are not being earned. If the present standard of living is to be maintained—and that is highly desirable—it can only be done on the basis of earnings. This refers to all classes in the community. The farmer has already done much towards taking the loss which a lower cost of living demands. He is working hard and spending carefully. Industrial workers in some lines have taken lower wages, but there is a general tendency on the part of the organized bodies to stand out for both high wages and short hours in spite of a reduction in the living cost. A more healthy situation here must be brought about. It is not so much a question of cutting down wages as it is of getting production at a price—getting a volume of goods at prices which the farmers and others can pay—and thus encouraging normal manufacturing operations and a wide distribution of the products which mean comfort and enjoyment.

The remedy for a condition that permits a 30-cent an hour man to get 60 cents and loaf half his time at that is an apprenticeship scheme that will be adequate to increase the ranks of the skilled mechanics and overcome the scarcity that is now stifling industry and particularly building. There is plenty of material from which to make skilled mechanics, provided the training system is good enough to persuade boys to learn a trade and interesting enough to make them want to stay in it. That is why we in the construction business must study the apprenticeship problem thoroughly and evolve a scheme that is adequate for our needs, which, by no means, are very light. Such a scheme will be our salvation.

Submerged Pipe Lines for Outfall Sewers

Factors Affecting Design and Construction—What Governs the Location of the Outlet—Material for the Pipes and Joints—Cost of Submerged Outfalls

Important features of the design, construction and operation of outfall sewers based on detailed descriptions of about 40 installations were given in a committee report presented to the sanitary section of the Boston Society of Civil Engineers. The report, which is printed in a recent issue of the Journal of the Society, follows:

Submerged outfall sewers are used to dispose of sewage in those cases where large bodies of water offer the opportunity for disposal by dilution and oxidation. They are therefore found on the seacoast, Great Lakes and large rivers. The proper method for pre-treatment of the sewage before disposal by a submerged outfall, depends on the dilution afforded, the condition of tides and currents, the character of the sewage, the proximity of bathing beaches and residences, and other local considerations.

The treatment varies from none whatever, to Imhoff tanks followed by filtration. Ordinarily, when the outlet can be located at a depth of 30 ft. or more below low water, and the direction of current is favorable, it is sufficient to remove or comminute the solids by subsidence, screening or otherwise. On the New Jersey coast, the clarification or so called "septic" tank has been used with good results, and seems preferable to the Imhoff tank because of the greatly varying period of detention between winter and summer use.

A check valve is required on the outlet of the tanks affected by tides, to prevent the entrance of salt water.

The governing condition of the design is to extend the outfall to a point where the water is deep enough to effect a satisfactory degree of dispersion before the sewage reaches the surface, and to be beyond the destructive action of the waves and the danger from shifting sand. A depth of not less than 30 ft. is preferable.

Materials

Pipes of cast iron, wrought iron, the latter galvanized or plain, and riveted steel, are almost universally used, although some large reinforced concrete outfalls have been recently constructed. A few wooden outfalls are reported, but they are short, and not typical of the kind that we are discussing, i.e., long submerged outfall that effects final disposal of sewage in deep water.

The life of ordinary steel pipe in contact with salt water is probably too short to warrant its use in permanent outfalls. The life of plain wrought iron pipe is from 15 to 20 years, which may be somewhat prolonged by galvanizing, although there is some doubt as to whether the extra expense is warranted. Cast iron and reinforced concrete are the most durable.

Sizes and Lengths

Sizes of pipe ranging from 6 in. to 84 in. in diameter are reported, and lengths from 36 ft. to 10,000 ft. The size depends upon the quantity of sewage to be conveyed, and the velocity resulting either from gravity flow or pumping. A self-cleaning velocity should be maintained or some provision for flushing be installed. The length is governed by the profile of the bottom, the depth decided upon for the outlet, the proximity of beaches, and the volume of sewage as affecting dilution.

Considerations Governing Location of Outlet End

The location of the outlet is governed by four considerations—(a), Stability of the bottom; (b), depth of water; (c), distance from beach; and (d), prevailing currents.

(a) Stability of the bottom: It is imperative that the outlet end of the pipe should be carried far enough out so as to reach a point where the bottom is stable. This will be found where the water is comparatively deep, beyond the zone of disturbance occurring near the beach where the wave action is most violent. If the outlet is within this zone, it is liable to be destroyed or buried up in shifting sand.

(b) Depth of water: It is desirable that the discharge of sewage should take place in the deepest water practicable so as to cause quick dispersion and minimize the apparent nuisance.

(c) Distance from beach: The outlet should be carried out as far as necessary to prevent visible pollution reaching the beach, and if the latter is used for bathing, the outlet should be so far removed that the bacterial count of the beach water is not materially increased.

(d) Prevailing currents: The prevailing current should be ascertained by submerged and surface float experiments, and a point selected for the discharge where the current is off shore all or most of the time.

Any one or more of these considerations may govern the location of the outlet, and therefore determine the length of the outfall. As an aid in studying these questions, soundings should be made over the areas considered as possible outfall locations, and a profile on the line of the proposed outfalls.

The outlet end of the pipe is off shore all or most of the time.

Any one or more of these considerations may govern the location of the outlet, and therefore determine the length of the outfall. As an aid in studying these questions, soundings should be made over the areas considered as possible outfall locations, and a profile on the lines of the proposed outfalls.

The outlet end of the pipe is usually secured to an anchor of masonry or piles and crib work or some such suitable combination, and turned up either vertically or at an angle of 45 deg. from 4 to 6 ft. above the bottom. Sometimes the discharge is horizontal through one or more outlets. A cast iron anchor block secured to the masonry is desirable to hold this bend. If a concrete anchor block is used, the concrete should be thoroughly mixed in the proportions of one quick-setting, natural, hydraulic cement, to six fine and coarse aggregate, combined to give a dense mixture, and carefully placed by means of a water-tight funnel extending down to the fresh concrete.

In the great majority of cases, the pipe is carried full size to the end, and the discharge all takes place at this one opening, but in some cases, particularly when the water is shallower than is desirable, these are top openings provided near the end, and the bore of the pipe is correspondingly reduced for the obvious purpose of getting wider dispersion, and to maintain a self-cleaning velocity. In a few cases, the outfall pipe is divided at the outlet end into a number of smaller pipes for the same reason.

Preparation of the Bottom

Only in the cases of the larger pipes is there usually any preparation of the bottom to receive the pipe. In the case of one large, 84-in., C. I. pipe a trench was dredged, and pile bents driven to support the pipes. The pipes were laid in this trench, and the jointing done by divers. In the case of the smaller pipes, however, no digging is required except through the crest of the beach and down to low water, and in special cases where there is danger of injury from boats' anchors or otherwise when the pipe is laid in a trench or protected by riprap.

When a submerged outfall extends beyond a pier head, which is usually advisable, to a distance of at least 50 ft., it should be laid without obstructing either the actual or legal channel or water-way, and so as to avoid injury by dredging operations or anchoring.

Joints

If cast iron pipe is used, the joints should be made with lead, and every third joint should be ball and socket, both for the smaller sizes to prevent breakage in launching as described below, and for the larger sizes which are laid in place by sections in order to conform to the contour of the bottom.

If wrought iron or steel pipe is used, the joints are usually screw joints, sometimes covered with lead-filled sleeves several feet long. This is good practice on the joints between high and low water where there is most liability to injury from the pounding of the breakers. It is also good practice to introduce a telescoping joint near low-water mark, which may be provided in connection with one of the sleeve-covered joints.

Some difficulty has been encountered where wrought iron and steel pipes are laid on pile bents, by the pipe rubbing against the bents until holes occur, for which reason this method of securing the pipe is questionable. In any case, where pile bents are necessary, or a timber crib work is used at the outlet, all bolts should be galvanized, and all washers cast iron.

Launching

The pipe, including the cast iron outlet block, is usually assembled on shore on the prolongation of the line upon which it is desired to deposit it in the water. Temporary ship's anchors are fixed in the bottom on the some line and at a considerable distance beyond, i. e., to seaward of the point where the outlet end is to be permanently anchored. A large sheave is attached to the temporary anchor, and a cable reeved through it, one end of the cable being attached to the outlet end of the pipe, and the other end to a large winch on shore. The pipe is supported on rollers or trucks, and is pulled out into position by the winch.

With wrought iron pipe it is necessary to provide ballast to prevent excessive buoyancy and injury by waves, which is accomplished by running wrought iron pipe inside and filling the latter with water.

With cast iron pipe, some means of buoyancy has been found advantageous. Two methods have been used to support the pipe in the passage from the permanent anchor point—one by slinging it from the pair of boats, and the other by supporting it on low trucks with thick wooden wheels, with devices for releasing the trucks when the pipe has arrived in its permanent position. In order to prevent fouling, it has been found useful to buoy the return cable from the sheave attached to the temporary anchors to the winch with oil barrels. The casting holding the raised outlet end of the pipe is deposited upon the permanent anchorage and secured thereto by divers.

Cost

The difficulty of presenting any definite figures as a guide in estimating the cost of submerged outfalls will readily be appreciated. Some of the factors influencing the unit cost of any outfall are the kind of pipe determined upon, length of submerged line, depth of outlet below mean low water, velocity of tide or stream, character of the bottom, atmospheric conditions at time of construction, method available for laying the pipe, and special provisions necessary to conform to sanitary regulations, etc. From our study of existing outfalls, we have, however deducted certain costs which are given in the following table and may be considered to represent average pre-war conditions. Under extreme circumstances, the costs were in a few instances 100 per cent in excess of and 50 per cent less than those below.

Size of outfall.	Price per foot. including outlet.
8 in.	$5.00
12 in.	6.25
16 in.	7.50
24 in.	10.25
36 in.	14.75
48 in.	20.00
60 in.	26.00
72 in.	32.50
84 in.	39.50

Operation

The submerged outfalls are reported, with very few exceptions, to have given satisfaction. Several instances are recorded where it is difficult to locate the outlet from any surface indication; others where the surface is discolored with a scum over but a small area immediately above the outlet; and some, however, where the discoloration extends for several hundred feet, although not objectionable. Such troubles as have been experienced, have arisen from two sources:

(1) Displacement or burying of the outlet due to its not having been carried out far enough to reach a stable bottom in comparatively still water, and beyond the region of shifting sands.

(2) Displacement and breakage of the pipe on the beach, due to the pounding of the waves and cutting away of the sand, leaving the pipe unsupported.

The remedy in the first case is obvious. The best remedy which seems to have been found for the second case is to enclose the exposed joints in long sleeves in some cases 12 ft. in length. These sleeves are made of iron or steel pipe split and flanged longitudinally and are packed with lead. One such protected joint should be made to telescope to provide for longitudinal expansion and contraction. The pipe should be buried above low water, and protected so that it will not be undermined by wave action, and should be laid with gentle changes of grade. The manhole at the shore end of the outfall should be sufficiently removed from the beach to be safe against tions. Careful inspection should be made of outfalls for deposits, leaks, damage by storms and other adverse conditions for satisfactory operation, and the trouble corrected at once.

If attention is paid to the points discussed above, and the proper precautions taken, there would seem to be no reason why an engineer should hesitate to install a submerged outfall sewer when this method of sewage disposal will satisfy the sanitary requirements of the case.

How May Surety Relations be Improved?

Personal Sureties Have Failed to be Adequate and Even Corporate Suretyship Has Given Trouble—Co-operation Between the Contractors and the Underwriters Will Bring Results

Bv Geo. W. Allen. before the Associated General Contractors

Suretyship coming down the ages has demanded a tremendous and awful toll. The highways are strewn with the financial wrecks of those confident and credulous inlividuals who have signed bonds for friends. Fortunes have been dissipated, homes have been mortgaged and lost, hearts broken, and families scattered. The destitution institutions of the United States, in fact, in the remotest corners of the old bases of the poorhouses, they have been literally filled with these unfortunates that signed bonds that were regarded as a mere matter of form, but when it came to be met with cold, hard cash, presented a different picture. No one signing a bond ever did it with the idea of incurring a loss thereunder, except the surety companies as they now exist, realizing surely and fully that the losses do come.

Tragedies of Securities

The memory of the harrowing experiences of those old personal sureties stands as a monument emphasizing the necessity of the modern business institution known as a corporate suretyship; and when we come to corporate suretyship we know that there are today men who have spent, we will say, half their lives in an endeavor to pioneer the way and blaze the trail and formulate the rules and tables of experience by which that business could be reduced to somewhere near an accurate science, if possible.

The hardships they have endured, the mental anguish they have gone through, the educational process in which they have had to indulge is beyond your slightest attempt at thought or your greatest endeavors to consider. When you consider that in 30 years 30 surety companies, each of which was well organized and splendidly capitalized, now lie in ruins—have been absorbed or reinsured to prevent failure, it gives you an idea that the troubles of the personal sureties have continued.

As to life and fire insurance companies the older lifes had their tables of experience, built for many years. The suretyship business as handled by the corporate institutions is comparatively so new that it is still in its swaddling clothes and we are still every day learning.

Co-operate and Reform

We have been trying to get the thinking contractors to help the conservative surety men who want the surety men educated.

When you carry out reform along the lines that you have discussed and recommended—as I know you surely will and must to preserve your business and preserve our business—if we are to continue to be able to write contractors' bonds, I know one of the first things you are going to say—co-operate with three or four only. Those three or four companies will get your co-operation now that have deserved it in the past and craved it.

We want to practice in your committee meetings; want to be regarded as one of you. We want the opportunity as surety companies to join the contractor's association and every builder's association and every organization that you have, that is for the dissemination of intelligence and for the enlightenment of every one. It goes farther than your interests and ours, important as they are to us selfishly; it goes to the material man with whom you deal every day the man who gives you credit; it goes to the owner. the public, the taxpayer on public jobs. It is a mighty important matter.

In reference to bid bonds that should be eliminated I differ with you on the suggestion made in one paper, that there should be a letter accompanying every bid in which it would be stated that the company was obligated forthwith to furnish bond instantly. If you were all required to put up cash, then those that have it are all right and if you have not it. you should not bid. Those of splendid moral standing, who stand in splendid estimation from your banker, will not have trouble in getting certified checks. When the contractor knows that it is not the formal bid bond that is put up obligating the surety company before it has an opportunity to know what foolish bid it may be, even on the part of a good contractor who may make a mistake, and when you get public bodies, clothed with proper authority (by amendment to the statutes if necessary, or by a code of rules governing and exercised by highway commissions and engineering boards) to enable a sensible determination of whether the bid is right before the contract is awarded, and then when a ridiculous proposition such as the Oregon matter comes up, the surety company is given relief right then and there and the bids are re-advertised. That is the relief you need. You may check your figures as best you can, checking with one another; but the inevitable mistake is the unforeseen or forgotten thing in many instances, which may mean thousands of dollars to you.

Oregon Case

I wish to make a little review of the Oregon sitution. I found it on a careful examination I had to make one day in my duties. The bid was so ridiculously low and showed such apparent irregularity as to suggest something wrong to the minds of the Highway Commission. They sent for the agent of the surety company to call his attention to it and said: "We know you are confronted with a $40,000 or $50,000 loss at least before you start and here are the reasons—." Little did they realize that he did not care, one of the kind with a stand-in, one of the grafters in the business that pollutes every business world.

He made misrepresentations to his home office, explaining away in a plausible manner why there was a difference in the bids. The home office asked him that question. The home office 3,000 miles away had the conservative thought of business men, the same thoughts that the engineer was having in Oregon and the same thoughts that we are having and that you are having. When you get the wave of thought going, it accomplishes your reform or anything.

The bond was written because they were obligated to it. The company sustained a loss, the last I heard, up to $70,000 and bidding fair to go to $125,000.

Irresponsible Contractor

I will tell you of another incident that happened recently, not far from here, where a simple telegram sent by the office of the surety company who received the request for the authority saved writing a contract of upward of a half million dollars. In this case the contractor had migrated, the financial statement he rendered as a basis of getting authority was at least six months back, in the meantime he had had trouble in his own state and he had just left with $36,000 cash. His statement showed cash in the bank, which was wanted by the bank and by other creditors over there, where there were $75,000 outstanding, unpaid bills on a job and only $25,000 retained percentage to pay them. The note was in the surety company on his bond over there, and here he was bidding desperately—he had to get that job and you and every one of the legitimate bidders who had worked on bids and papers and specifications did not have a ghost of a chance.

We told him that we could not write a bond and why, which emphasizes the very thing that I told you. Give your surety the confidence that anybody endorsing your note is entitled to receive. It is kept confidential. Some of you give your ratings to Dun and statement for ratings to mercantile agencies. You hesitate to do that for the bonding company, but you don't have to hesitate to give them to a surety company any more than to your banker.

Have you ever heard a banker asking that he be allowed to loan the bank money? Would you regard that bank as a safe place for your deposits?

Hands Across the Industry

Those of you that want to accomplish reforms are going to protect—somewhat the same as you would your family—your business, by calling in those that you want to work with you and help you to protect it; and we want you to help protect us, for we are sailing along together. We are not in the surety business merely because there are contractors and because there are contract bonds. We write bonds of every nature. The bonding business guarantees the acts and omissions of men. Think of the omissions! The contractor knows omissions when he thinks of specifications. Guaranteeing acts, means any kind of an act. We write five or six hundred different kinds of bonds. We give general service in one of the greatest branches of business. Of course, we want to write contractors' business. We want to be a part of that public protective institution that is now being made that will give the service. Where would you all be, if it hadn't been for the conservative things the men building up corporate suretyship as a real protective institution have done, the struggles they have been through to make it possible for surety companies to exist?

Would you sign one another's bonds? I have never seen a man in the contracting business that wants to sign anybody else's bonds. He knows what it means. When you look back at the departed spirits of 30 surety companies you realize what it means, and you understand the struggles that have gone into the making of the three or four conservative surety companies. They have been through trouble. Do you not appreciate then that they have done something for business and for you and for all of us?

Speaking of failures in contracting firms, the statistics that we have been able to gather over the last few years tell us a startling story, that the average life of the contractor—individual, firm or corporate partnership—is only seven years. When you figure the statistical determination of the surety experience, and you occasionally read of one of the better companies paying a dividend, you think perhaps that this surety business is a pretty good business; but if you had taken the experience of these better companies that I have mentioned, you would have figured that it would be just a fair return on the investment, about the same as an office building, not much better than owning good commercial paper when it paid a little more than it does now. But it is not good when you consider the terrible mental struggles and awful work of the surety man. You must consider the experience of all the surety companies that have failed, and it is a terrible tale.

The bank's money must be conserved—also the surety's. The rights of the stock-holders of both are the same and the obligation to the public is just as great. Bear us in mind as a financial institution. Do not judge us by the many loose solicitors who are foolish and do not know what you are doing. You pay your bank from 6 per cent to 8 per cent. Once in a while some officer in the bank is getting something that the bank does not know about—not from responsible contractors, but that is an evil we must watch. Once in my experience I encountered a contractor who had a private partnership with a bank officer. The division of the profits as well as sharing the losses on the part of the bank resulted in the ruin of the contractor and the banker individually.

The surety company charged one-fourth of one per cent at first and now it is one and one-half per cent. It has been said by many responsible contractors that they pay for the experience of the loose contractors who get their bonds too easy, and I think the honest surety man will tell you that is true. Furthermore, the one and one-half per cent we are getting does not begin to pay the losses that we have on some of the better contractors. We aren't making anything out of it, even though you are paying what you regard as too much. We want to see your surety rates reduced and we want to cooperate and help you get them reduced.

You have an association such as this with branches. Let the surety companies join. Have them send conservative, reputable surety men to your committee meetings to make and accept suggestions.

I am going to refer to the Northern California Road Contractors' Association with headquarters in San Francisco. It extended an invitation to all surety companies to become members. About four companies joined. That Association has a system or method most commendable; the effects which it produces can not be overlooked. In the first place they employ engineers and any member may have his bid corrected or checked. The members come and get their bids checked. They do not compare and show one another's figures—they keep above that. Those old practices caused several former associations to break up because cliques sprang up who showed each other bids. It was an evil which naturally crept in, even with the better ones.

Now they exchange equipment with one another. The equipment of all is there for the benefit and use of all. They do all they can to help. You file a financial statement with the association which is regarded very carefully and confidence is not betrayed. They investigate what men have been doing and where they were.

The losses of the surety company on the bonds of members of that association have been nil, absolutely nil. We cannot find a case in our investigation of the men that have been bonded as members of that association where the association has ever had even a claim filed. A few preliminary notices have been made by mistake.

Should not we co-operate with that association? We would be arrogant indeed; we would be ignorant and unmindful of the very things that we want to do to help if we refused co-operation. Surety companies that have co-operated with that association have been vilified, attacked unjustly, motives misconstrued, accused of rebating to the association, put on the defensive and a hearing held.

Companies on the Defensive

Those surety companies were placed on the defensive for co-operating with men like you. I will go on record that the surety companies can well afford to allow branches of the A.G.C. and such associations as I mentioned a moment ago a direct contribution, based upon certain percentage of the premium income, to help pay the expenses of that association, to help you hold your conventions. Did not some of the surety companies contribute to this convention? Why, of course they did; why wouldn't they. You will contribute to the Salvation Army to help save some poor devil's soul. Why not contribute money to an association to help save the business?

Beware Loose Surety Man

The loose surety man that you have talked about bolsters, inflates the standard of the loose contractor and puts him on a parity with the good contractor of responsibility. It isn't fair to you that it be done. Do not have surety companies writing more bonds which are not worth anything based upon their experience, nullifying all of your acts and everything you have done for years.

On the Pacific Coast recently a man who owes $300,000 got a bond from a certain surety company on a $400,000 contract, yet he has not a dollar in the world; it is only by the sufferance of good luck that he is not in bankruptcy now and he is apt to be put there any time. Why they went on his bond is beyond the honest thought.

In most all the surety companies there are now a majority of executives who are honest, serious, sensible men who are struggling each, within his company perhaps, against a fraction of loose unconservatives. If you were to take all the good, conservative officers of surety companies today and distribute them around, cull and pick out the loose ones, the surety business would be on a plane where it deserves to be and where it soon will be. We are going to fight for that.

Get behind us. Rub it into the loose surety man; when one comes around to your office, don't let him in. Those men will tell you they do not get a share of the business. You tell them they do not deserve it. If they have to do business that way, you do not want to do business with them. Give your bonds where you feel there is co-operation with the real surety man, be he broker or be he agent—there are many estimable brokers in the insurance business who are just as careful as the surety agents.

Railroad Construction in Finland

The President of Finland has recently sanctioned the Government's proposition to the Finnish Diet, covering a program of railroad construction to be handled during the next five years. This program is based upon the assumption that 75,000,000 Finnish marks could be devoted to such work annually. Altogether the different lines recommended for construction in this connection have a total somewhat in excess of 500 miles. Therefore, it may be expected that Finland will construct about 100 miles of railroad annually during the next few years.

In addition to the above construction work that is to be carried forward under Government auspices, provision is made for additional construction whenever the various communes will provide the necessary funds for supplementary construction. Obviously it is not possible to estimate the extent to which public sentiment will support such a program, but reports indicate that something along these lines may develop.

F. E. Latimer, 162 Preston St., Ottawa, is the contractor for a two storey, brick, stone trimmed office building for Beach Foundry Ltd., Hinton Ave., Ottawa. The cost will be about $15,000. Mr. Latimer was also responsible for the erection two years ago of the Beach foundry and last year of the Beach Motor Ltd. building both costing over $100,000.

One of Quebec's Steel Bridges

Bridge at Ste. Gertrude, Nicolet County, on the Petit Bras river

List of Awards for Ontario Provincial Highway Contracts

Unofficial

791	Bridge superstructure between Barrie and Orillia	Ontario Bridge Co., Crown Office Bldg., Toronto, Ont.
792	Bridge superstructure between Barrie and Orillia	Ontario Bridge Co., Crown Office Bldg., Toronto, Ont.
795	Concrete pavement from Woodstock to Ingersoll, 7.1 miles	Paul Bergmann, King St., Waterloo, Ont.
908	Bituminous penetration pavement from Black's Corners to Freelton, 5.7 miles	Dufferin Construction Co., 210 Victoria St., Toronto, Ont.
800	Macadam base course, L'Original west 5 miles	Geo. Farmer & Sons, Ottawa, Ont.
801	Macadam base course, east limit of Cornwall easterly 3.1 miles	Edgar Irvine & Co., Alexandria, Ont.
805	Grading from Joyceville south, 2.6 miles	J. A. Smith & N. Greenlas, Joyceville, Ont.
806	Grading from south limit of Innisfil Twp. northerly 4.0 miles	Curran & Briggs, 51 Rusholme Park Crescent, Toronto, Ont.
807	Grading from Caledon Mills to Melleville Hill, 5.3 miles	National Tie & Timber Co., Funstrun, Ont.
809	Grading from Rockwood west, 3.1 miles	National Tie & Timber Co., Funstrun, Ont.
811	Grading from Leamington to Ruthven, 3.0 miles	Geo. Campbell, Essex, Ont.
812	Grading from Ruthven towards Essex, 6.0 miles	Geo. Campbell, Essex, Ont.
813	Grading from Maidstone east, 4.0 miles	William Beggs, Woodslee, Ont.
814	Grading from Ruscom east and Comber east, 2.8 miles	James McMurren, South Woodslee, Ont.
816	Surface treatments of macadam roads with tar, Napanee easterly, 5.7 miles	W. Huber, 97 Keele St., Toronto, Ont.
817	Surface treatment of macadam roads with tar, Kingston westerly 8.0 miles	W. Huber, 97 Keele St., Toronto, Ont.
818	Surface treatment of macadam roads with tar, Kingston easterly 15.0 miles	W. Huber, 97 Keele St., Toronto, Ont.
819	Concrete culverts, Crosby South Twp.	Wallace & Sons, Smith's Falls, Ont.
821	Concrete culverts, Nepean (Base Line)	C. O. Wood, 154 Cameron Avenue, Ottawa, Ontario.
823	Concrete culverts, Osnabuk	Ontario Bridge Co., Crown Office Bldg., Toronto, Ont.
824	Concrete culverts, Lancaster	Seymour & Marpaw, Cornwall, Ont.
825	Concrete culverts	R. H. H. Blackwell, 57 Queen Street West, Toronto, Ont.
829	Concrete pavement, Manoticke, 0.54 miles	Lumsden Engineering & Transport Co., 6 Adelaide Street, East, Toronto, Ont.
834	Macadam base course, Caledonia northerly 5.7 miles	Law Construction Co., 107 Hillsdale Avenue, East, Toronto, Ont.
835	Grading from Plantagenet easterly 8.0 miles	A. Bisonette, Alfred, Ont.
838	Grading from Haley's Deviation, 6.0 miles	Grant Bros., Bank National Bldg., Ottawa, Ont.
842	Grading, Whitby-Lindsay, 5.0 miles	Lumsden Engineering & Transport Co., 6 Adelaide Street, East, Toronto, Ont.
839	Concrete pavement, North Gower	
		King & Holmes, Oakville, Ont.
840	Concrete pavement, Kemptville, 1.0 mile	King & Holmes, Oakville, Ont.
841	Macadam base course, Spencerville, 0.65 miles	Geo. A. Chenery, Whitby, Ont.
843	Grading, Whitby-Lindsay, 5 miles	Geo. A. Chenery, Whitby, Ont.
845	Grading from Goderich east 3.9 miles	Webster Construction Co., Bank of Toronto Bldg., Toronto, Ont.
846	Grading from Seaforth to Mitchel, 6.0 miles	Webster Construction Co., Bank of Toronto Bldg., Toronto, Ont.
870	Grading from Brampton south, 1.9 miles	Canadian Engineering and Contracting Co., 72 James Street, Hamilton, Ont.
922	Grading from Beachburg west, 5.2 miles	J. R. McQuigge, Arnprior, Ont.
924	Grading from Brampton northerly, 10.4 miles	Randolph McDonald Construction Co., Ltd., Crown Office Building, Toronto, Ont.
925	Grading from 1 mile west of Hurontario Street, Brampton, westerly 3.0 miles	Britnell Contracting Co., Ltd., Baxter Street, Toronto, Ont.

926	Grading from Oldcastle to Dougal Road, 2.9 miles	Geo. Campbell, R. R. 4, Essex, Ont.
935	Bridge substructure over C.P.R. on Clappison Hill	Geo. Campbell, R. R. 4, Essex, Ont.
930	Grading in Greenock and Kinloss Twps., 4.2 miles	T. G. McLean, Wingham, Ont.
931	Grading 2 miles west of Arthur, westerly 1.5 miles, and 9th to 11th concessions, Arthur Twp., 1.8 miles	John Gaffney, West Moncton, Ont.
932	Grading from Aylmer easterly 3.0 miles	L. E. Dancey, Woodstock, Ont.
849	Surface treatment of macadam roads with tar from 3.2 miles west of Cornwall to Lancaster 12.3 miles	J. B. Dunkley, Northcliffe Blvd., Toronto, Ont.
851	Surface treatment of macadam roads with tar, Orillia towards Washago, 5.0 miles	J. B. Dunkley, Northcliffe Blvd., Toronto, Ont.
850	Surface treatment of macadam roads with tar, Barriefield North Easterly, 4.7 miles	W. Huber, 97 Keele Street, Toronto, Ont.
852	Concrete culverts, Ekfrid Twp.	Waltham & Kelley, Kenwood, Ont.
857	Concrete culverts, Caradoc,	Waltham & Kelley, Kenwood, Ont.
853	Concrete culverts, Mosa,	A. J. Kirkpatrick, Petrolia, Ont.
854	Concrete culverts, Gosfield South and Raleigh Twps.	Jas. McGill, Harrow, Ont.
856	Concrete culverts, Warwick Twp.	D. B. Dann, Clarkhill, Ont.
859	Concrete culverts, Minto and Howick Twps.	J. Avery & Sons, Mitchell, Ont.
916	Concrete pavement, Kitchener west, 3.11 miles	Carl Damman, 21 Albert St. E., Kitchener, Ont.
862	Concrete pavement, Welland westerly, 1.4 miles	W. C. Brennan Contracting Co., Melrose Ave., Hamilton, Ont.
939	Asphaltic concrete pavement, Stittsville to Bell's Corners 7.5 miles	Grant Bros., Bank National Bldg., Ottawa, Ont.
866	Macadam base course, Clarence and N. Plantagenet, 5.5 miles	Berthiaume & Co., Hawkesbury, Ont.
876	Macadam base course, Farran's Point easterly, including grading, 3.0 miles	Frank Milligan & Co., Orillia, Ont.
960	Macadam base course, Perth north-easterly 5.0 miles, including grading	McNamara Bros. & Thornton, Sault Ste. Marie, Ont.
942	Macadam base course from 1¼ miles west of Summerstown westerly 1.9 miles, including grading	Chisholm Wellage Co., Cedar St., Brockville, Ont.
867	Grading from Walkerton west 7.1 miles	Warren Bituminous Paving Co., 54 University Ave., Toronto, Ont.
868	Grading from Harriston westerly 4.8 miles	Britnell Contracting Co., Ltd., Baxter St., Toronto, Ont.
869	Grading from St. David's to Queenston, 1.0 miles	Law Construction Co., 107 Hillsdale Ave. E., Toronto, Ont.
883	Surface treatment of macadam roads with tar, Dunnville to Cayuga, 16.4 miles	Law Construction Co., 107 Hillsdale Ave. E., Toronto, Ont.
885	Surface treatment of macadam roads with tar, Peterboro south 9.5 miles	Law Construction Co., 107 Hillsdale Ave. E., Toronto, Ont.
871	Grading from Beckett's Bridge to Fork's Road 2.3 miles	W. J. McAuliffe, 85 Colbeck St., Toronto, Ont.
872	Grading to Delhi, 0.4 miles	Geo. A. Smith, Delhi, Ont.
873	Grading from St. Thomas to Aylmer, 9.4 miles	M. L. McLean, Simcoe, Ont.
914	Grading from Hagersville to Jarvis, 5.1 miles	R. Honsberger, Vineland, Ont.
877	Grading Sligo Hill	Cameron Bros. & Hutt, Berwick, Ont.
878	Grading at North Creek	Cameron Bros. & Hutt, Berwick, Ont.
880	Grading Chatsworth south east 3 miles	Canadian Engineering & Contracting Co., 72 James St. N., Hamilton, Ont.
881	Grading from Chatsworth northerly 3.6 miles	Canadian Engineering & Contracting Co., 72 James St. N., Hamilton, Ont.
961	Grading from Washago south 4.7 miles	A. B. McLeod, London, Ont.
882	Surface treatment of macadam roads with tar, Niagara Falls to Welland, 13.2 miles	Albion Paving Co., Montreal, P. Q.
884	Surface treatment of macadam roads with tar, Caledonia to Hagersville, 7.9 miles	Albion Paving Co., Montreal, P. Q.
933	Bridge substructure, Arthur bridge	C. G. Callahan, Arthur, Ont.
934	Bridge substructure, Credit River, Norval, 3 bridges	W. E. Tidy, 37 Metcalfe St., Toronto, Ont.
936	Bridge substructure, Aux Sable River bridge	Canadian Des Moines Steel Co., Inshes Ave., Chatham, Ont.

917	Bridge substructure, south of Brampton, 2 bridges and Sligo Hill bridge	W. E. Tidy, 37 Metcalfe St., Toronto, Ont.
886	Concrete culverts, Carrick Twp.	Jacob Palm, Mildmay, Ont.
887	Concrete culverts, Brant, Greenock and Kinloss	G. A. Gibson, Wroxeter, Ont.
888	Concrete culverts, Kincardine,	Hyland Construction Co., Toronto, Ont.
889	Concrete culverts, Holland, Sullivan, Derby and Sydenham Twps.	J. Avery, Mitchell, Ont.
890	Concrete culverts, Artemsia, Glenelg, and Holland Twps.	W. P. Holdcroft, Kingston, Ont.
891	Concrete culverts, Holland	William Clark & Sons, Owen Sound, Ont.
892	Concrete culverts, Melancthon	V. T. Bartram, Bank of Toronto Bldg., Toronto, Ont.
893	Concrete culverts, Pronto, Artemesia, and Melancthon Twps.	V. T. Bartram, Bank of Toronto Bldg., Toronto, Ont.
940	Concrete culverts, Artemesia and Glenelg	J. A. Vance, 197 Light St., Woodstock, Ont.
956	Concrete culverts, Normanby, Egermont, Bentinck and Glenelg	J. A. Vance, 197 Light St., Woodstock, Ont.

A Dozen Questions for the Concrete Man

Some Queries Asked at the American Concrete Institute Convention and the Answers that were Given—Practical Points that the Concrete Contractor is Interested in

At the recent meeting of American Concrete Institute the Question Box was a prominent feature. The questions in the Question Box were propounded by Institute members prior to the convention and were assigned to other members for discussion. A number of the questions were grouped, because they were closely related, and in such case more than one question was assigned to one member to answer. In no case was a question assigned to the one who submitted it, but further discussion was invited on the floor of the convention, where the first speaker did not use the six minutes allowed for each question. The following were some of the questions and answers as reported in "Concrete."

* * *

Cinder Fill

How may cinders be used for roof fill most successfully to avoid expansion and displacement of parapet walls?

The question was assigned to L. C. Wason, president Aberthaw Construction Co. Mr Wason's answer to the question was read and was to the effect that the best way to avoid the bad results referred to was to omit the cinder fill and place the roofing directly on the concrete slab. In the discussion of this question, the possibility of using cinder concrete to replace the dry cinders was suggested, the cost being given as about double the cost of dry cinders. One case was cited where a 1:3½ cement cinder concrete expanded sufficiently to push out the parapet wall, there being no plastic joint between the concrete and the parapet wall to take care of the expansion.

Does the saving which the use of slag entails warrant its use in reinforced concrete building?

In reply, John A. Ferguson cited results showing that the strength for slag concrete exceeded by 50% the concrete made with Pittsburgh river gravel, where the cement factor and water cement ratio were the same in both cases.

* * *

Safe Unit Stress at 24 Hours

Provision is usually made in all building laws for the maximum loading to which the concrete may be subjected in compression after it has attained its full strength. We frequently have occasion to apply loading to concrete which is only a few days old, sometimes by means of hydraulic jacks and in other cases by direct loading. We are always confronting the assumption that we are overloading the fresh concrete. What would be considered the safe unit stress in compression on concrete 24 hours old under normal conditions of weather and materials, assuming a 1:2:4 mix? What expedients other than those customarily employed can be used to increase the value of concrete in compression under the above circumstances?

The strength of concrete at 24 hours involves factors which do not enter into the later strength of the concrete, according to A. R. Lord, to whom the question was assigned for answer. The variations in strength of concrete where different brands of cement were used was pointed out as being one of the important factor governing 24-hour strength. Comparatively heavy loading is considered permissable in building alterations where the area loaded is small and the new concrete able to withstand higher stress.

The use of Cal to increase the early strength of concrete was suggested, and one instance cited where the use of 8% of Cal in caisson construction allowed a caisson to be pushed down in 12 hours, where previous time was three days.

* * *

Integral Waterproofing

Is the value of integral waterproofing purely psychological in its effect on the contractor?

In discussing this question, S. C. Hollister pointed out that when a contractor or foreman is instructed to use integral waterproofing, the instructions go along with the use of the waterproofing that very good concrete is to be made in order to get the proper results, and that the actual purpose of the waterproofing is not clear.

Included among the integral waterproofing compounds are the finely ground materials such as tufa or trass, about which there is some doubt as to the chemical action with the cement in the concrete. With the waterproofing which depends upon chemical processes, the principal function is to make the pores of concrete water repellent.

It was pointed out that while waterproofing may be required in some cases, to overcome defects, such as cracks in the concrete, and may also be desirable to increase the workability of the concrete without [illegible] the consistency, where surrounding conditions are ideal by the proper mixing and placing of concrete no integral waterproofing is needed.

* * *

Applying Laboratory Knowledge

How can laboratory tests which are now being made with regard to consistency of concrete be put into practical use?

In answering the question as to how laboratory tests which are now being made with regard to consistency of concrete, can be put into practical use, W. A. Slater, engineer-physicist, Bureau of Standards, stated that in general there are two places for measuring the consistency: (1) the measuring of the proportions, and determining the mix in the laboratory, and (2) the inspection of concrete in the field to reach the conditions aimed at. Variations such as sand, water, etc., unless properly watched, may be such as to throw out the value of any test for consistency. Certain conditions are to be agreed upon and conditions in the field regulated so as to preserve the proper relation between field conditions and the laboratory tests.

R. B. Young stated that it was his conclusion that tests were impractical with the material available, and the lean mixture, with crushed rock aggregate graded up to 2½ in. used in connection with the Queenston-Chippawa power development work. The flow table was found to be impractical for average field conditions. Best results were obtained by limiting the amount of water to the bag of cement in the batch, and when a larger percentage of fine material necessitated additional water, proportionate cement must be added.

* * *

Corrosion of Reinforcing

Rusting of steel reinforcements in concrete construction causes the breaking or splitting off of concrete and otherwise injuring the work. What is the best method of keeping the steel from the exterior surface? How much protection is necessary? What is the best way to make repairs where the damage occurs?

The rusting of steel reinforcement in concrete construction, it was stated by Mr. M. Upson, gives more concern than any other question, because engineers are not careful enough in design.

The trouble generally begins at expansion joints. Various steps can be taken to prevent the rusting of reinforcements, the first being to get the engineer to design expansion joints properly; second, to keep the steel away from the surface of the concrete; and third, by binding the steel together so as to ensure that it is held in its proper place. Reinforcing steel may be kept away from the surface with the aid of concrete blocks that hold the rods the proper distance away from the forms.

The amount of protection necessary for the reinforcing rods in concrete depends upon the concrete and local conditions. In some instances, the steel may be allowed close to the surface, while in others it should be 10 in. back. The report of the Engineering Institution of Great Britain on structural materials in harbor structures recommends 1½-in. to 2-in. protection in harbor construction.

In precast units, the steel should be kept as near the surface as possible, and yet allow the proper protection so as to be away from the neutral axis, to prevent cracking in handling. In touching up or repairing concrete where the reinforcing is exposed, the cement gun is recommended for use after the steel has been cleaned with the sand blast.

* * *

Finishing Floors

Is it better to install cement fill and finish before or after plastering is done?

What methods have been found successful in making concrete floor finish set up quickly in cold weather?

The advantages of curing monolithic floors by keeping them wet have never been realized by or brought home to building contractors as they have to road contractors. A discussion on how to get a hard, non-dusting concrete floor would be helpful.

What is your experience with the use of chemical hardeners for preventing dusting of concrete floors and to improve waterproof qualities?

In the discussion of these questions, by N. M. Loney, vice-president Thompson-Starret Co., the ordinary methods for making concrete floor finish set up quickly in cold weather were mentioned as including the use of preparations of calcium chloride, hydrated lime, hot water and heated aggregates. The use of accelerators for floor finishing was believed justified, inasmuch as they would definitely fix the time when finishers could get on the job.

The proper curing of floors is sometimes prevented by the fact that owners are not willing to give the builders the proper amount of time to finish the floors, and poorer results are obtained. The advisibility of educating the owners, engineers and architects to allow proper time for curing was pointed out as a requisite for good floor surfaces.

Floor hardeners having magnesia fluo-silicate as a base were mentioned as having some merits, especially on floors not too defective. If floors are properly finished, the hardeners give good results.

* * *

Placing Concrete—Chute or Buggy?

What is the most economical method of handling concrete on a job considering quality as well as cost? This means from the time it leaves the mixer until it reaches its final destination in the building.

Why do some of the biggest and most successful contractors place their concrete from buggies rather than through chutes? What are the relative advantage of the two methods of placing?

What are the advantages of distributing concrete from the mixer through chutes, buggies and wheelbarrows? You may know that although the chute is very popular among contractors, several of the leaders who have studied the problem very carefully very seldom use them. "There is a reason."

How would you determine whether the tower and spouting system or elevator was most economical and best adapted for concreting a particular job?

In discussing the questions as to the comparative merits of buggies and chutes for placing concrete, H. C. Turner stated that better control is to be had by hoisting and delivering the concrete with buggies than by chutes. No great economy results with chuting, according to Mr. Turner's experience, except under certain conditions, such as of abnormal labor cost. The importance of water control in the concrete mix was emphasized and the fact pointed out that there was a tendency to neglect the control of the water where chutes were used for placing the concrete, with the result that the concrete was not of the proper consistency.

That on some types of building, the showing made by the chuting method may be reversed as compared with other types of equipment for placing concrete, is the experience of W. F. Lockhardt, who further stated that the time element and the size of the building in question were important factors that enter into the question. The use of chutes was to be recommended usually only on jobs involving not less than 4,000 cu.yds. of concrete. Instances were mentioned where concrete placed through chutes which tested 1,800 lbs. per sq. in. had been improved by the cutting down of the amount of water so that the resulting strength of concrete was raised to 3,300 lbs. per sq. in., and the conclusion was drawn that it was possible to place much drier concrete through chutes than is ordinarily used in connection with chuting equipment. The type of structure has considerable bearing on the method used, whether chuting equipment or buggies are employed in distribution.

* * *

The Concrete Specialist Contractor

Is the concrete specialist contractor about to become a thing of the past?

The question as to whether the concrete specialist contractor is about to become a thing of the past was answered in the negative by H. C. Turner, stating that this is a day of specialists, and that the specialist will continue in the building industry. Concrete building problems are classified as different from those with brick and steel. It is a peculiar material and special equipment and special organizations are advantageous in carrying out concrete construction.

* * *

Batch vs. Continuous Mixing

Why does the average contractor use a batch in preference to a continuous mixer?

Continuous mixers are not suitable in building construction, since there is a difficulty in controling the mix where the process is continuous, according to J. G. Ahlers. Mechanical operations and the conditions at hand are the controlling factors to be taken into consideration. In building construction, it is necessary to hoist the concrete, as it is practically all used at a point higher than where mixed. This also favors the batch mixer.

* * *

Pre-mixed Aggregate

Is the use of pre-mixed aggregate now on the market and in common use in some cities to be encouraged or discouraged for concrete structures of small sections, such as occur in building work? Is the use of pre-mixed aggregates economical? What are their other advantages and disadvantages?

What is the range of variation in the grading of pre-mixed aggregate at the time it enters the mixer What is the effect of the above variations on the yield, cement factor, water-cement ratio, density and strength of the resulting concrete? Are these variations sufficient to necessitate correcting measures, and if so, what is the best method of determining and making corrections? What are the comparative costs per cubic yard of concrete made from mixed aggregate and separate aggregates?

Ready mixed aggregates should be encountered, since their use has been found economical, particularly where they occur ready mixed in nature.

In cases mentioned by J. G. Ahlers, there was more variation in the tests taken on the dredge, where the mixed aggregate was being transported than at the time of going into the mixer. It was found that corrections could be based upon one sieve analysis, because of the continuity and uniformity of the ready mixed aggregate.

The suitability of natural mixed aggregate was evident from the fact that on 5,000 yds. the maximum variation of only 2/10 in fineness modulus was noted.

Belleville's Water Supply

The Council of Belleville, Ont has decided to make a start on additions to the water supply. A report has been submitted covering a new intake pipe, repairs to the old intake, a gasoline driven pump, a new water supply main and a water purification plant involving the total expenditure of about $350,000. The council has decided to proceed at once with a new intake and a gasoline driven standby pump estimated to cost $100,000. E. T. Austin, is water works manager, and Gore, Nasmith & Storrie, Toronto are consulting engineers.

Sewage Disposal at Kitchener

Acting on the advice of city engineer Stanley Shupe, the council of Kitchener, Ont., has called in Gore, Nasmith & Storrie, consulting engineers, Toronto, to investigate and report on the sewage disposal works necessary for the treatment of the city sewage. The recent injunction by the courts has compelled the city to take this action.

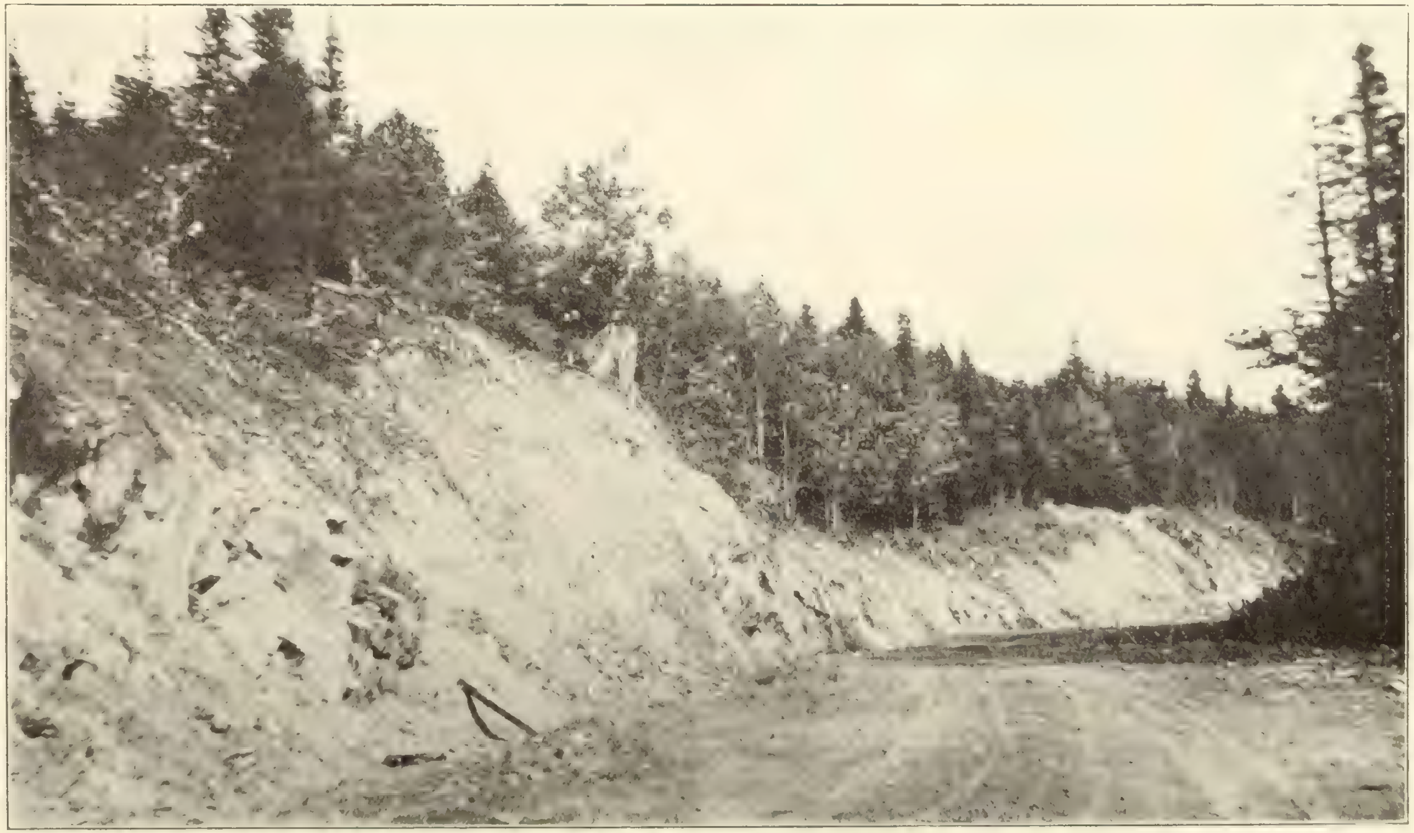
Trade Publications

Rail Steel Reinforcement.—Burlington Steel Co. Ltd., Hamilton, Ont., has published an attractively printed and illustrated volume of 84 pages on rail steel for concrete reinforcement. Information is given as to the source and manufacture of steel bars, both from rail steel and billets, the various grades of reinforced steel and the properties peculiar to each It is the aim of the publication, by presenting a full description of the manufacture, physical properties and use of rail-steel bars to answer attacks on this product made by distributors of billet bars. The text, however, is technical, not controversial, among the topics discussed being a comparison of the different grades of steel, with particular reference to crystallization, uniformity, brittleness and bending. The last portion of the volume is devoted mainly to photographs of structures reinforced with rail steel bars, including large public buildings, office and industrial structures, grain elevators, dams, sewers and other public works, bridges, roads and docks. The text concludes with standard specifications for concrete reinforcement bars. The Burlington Steel Co., will be pleased to forward a copy of this booklet to any interested persons on request.

The Kaelin Electric Steam Generator —Bulletin 101

An attractive pamphlet, containing 16 pages, 8¼ by 10½ is being distributed by the Dominion Engineering Works, Limited, Montreal. This publication outlines the field of this new coal-conserving device and describes its construction operation and control. The bulletin is well illustrated with half-tones and sectional views, and contains a very complete chart for working out the comparative costs of coal-fired and electric steam plant under various conditions.

HIGHWAY CONSTRUCTION IN NOVA SCOTIA



Monastery Mulgrave Road, built under the federal aid scheme. Crushed stone macadam road. Mulgrave Section, Cook Construction Co., Contractors

The Load Curve of Construction Equipment*

Can the Purchase of Mechanical Plant at High Prices be Justified?—Cost of Running Machines Can be Lowered by Intensive Operation—Use One Machine for Several Operations

During the period of the world war and for two years thereafter, the great increase in construction required by the public utilities to meet demands made by industry, and the shortage of skilled and common labor, made imperative the purchase of equipment which would multiply the effectiveness of man power. Designers and builders of this class of machinery recognized the demand and produced equipment to meet the needs of the utility, and only by the co-operation of manufacturer and user was it possible to carry out the tremendous program of those years.

With labor very scarce and quite inefficient, even with the high prices of construction equipment, it was not a difficult problem to justify the investments; but, with the economic curve sloping in a downward direction, the problem to be faced assumes formidable proportions. The depreciation and interest rate applying on war-time purchase prices imposes a unit fixed charge, which, added to the general operating expense, makes costs nearly approach the unit costs under hand methods current before the war. And were it possible to dispose of this equipment, it seems, at times, as though a return to former practices would be the better course.

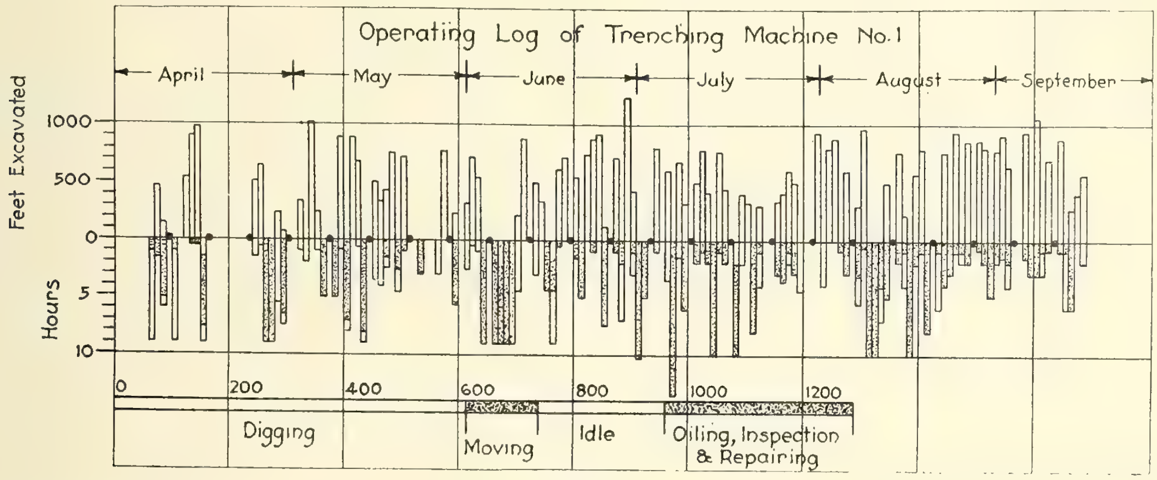


Fig. 1

Intensive Operation Improves Machine Costs

The solution of the problem is, of course, "intensive operation," or an improvement of the load curve, to the end that the overhead charges may be spread over a larger number of units. It is not the purpose of the writer to claim that this result has been achieved in any considerable degree, but, rather, to present some of the methods that have been considered as a means to that end.

Figure 1 represents the load curve of a wheel type trenching machine having a maximum capacity of a trench 24 inches wide by 6 feet deep, and which is considered to be of the highest type construction in its class. The shaded areas above the line represent lengths of trench excavated, and the shaded areas below show, in hours, the time the machine was out for repairs, inspection and general oiling. The white areas represent, in hours, the time of moving from job to job. It should be stated, however, that the machine should be penalized as fully as this curve would indicate, for it is undoubtedly true that the total amount excavated might have been increased had it been possible for the pipelaying gang to keep up. This was noticeable where short lines were laid, inasmuch as the time required for the connection was great in proportion to the time for the laying of straight pipe. The result was that the operator would spend time repairing or overhauling, which might as well have been devoted to digging had there been work to do.

In figure 2 are presented three curves giving the performance of the machine by weeks. The first curve, or "machine operator's score" gives values of hours digging plus hours moving divided by hours digging plus hours moving plus hours repairing. Idle time is not considered in this curve, inasmuch as the operator is not responsible for the time when there is no work provided for the machine.

The second curve or "general foreman's score," checks the total time of digging, moving and repairing to total working hours, and is an index of the degree to which work was provided for the machine.

The third curve is a combination of the first two, and represents the value of the machine to the District.

Improvement of Score

By decreasing repair time and increasing digging time, it will be possible for the operator to increase his score. Since digging time is figured by measuring the amount of trench opened and dividing by allowance of 100 feet per hour, it is not unreasonable to expect that a score of between 90 and 100 may be obtained by the operator. While the machine is capable of digging 138 feet per hour, an allowance for "digging in," raising over other services, cleaning of buckets when necessary, oiling, greasing and adjustments, makes 100 feet per hour for the entire day a reasonable average to expect.

The general foreman will be able, by better co-ordination of his work, to reduce the idle time and to obtain a higher score. Pipelaying gangs can be directed to follow the machine as may be necessary to keep their part of the work as closely behind the trenching machine as possible, and when numerous or difficult connections are necessary, extra gangs may advantageously be used to keep the progress at a maximum.

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*By H. V. Knouse before the Iowa section of the American Water Works Association.

It is proposed to furnish a corrected score sheet weekly to the men interested, and to instruct them so that they may figure their score day by day and thus be fully informed as to how they are succeeding in obtaining maximum results. While this should result in obtaining a better load curve for the machine it should also result in increasing the efficiency of all correlated work.

It is confidently expected that, by using the system of records, the men responsible for the various factors will be able to visualize the progress of their work and so increase the operating efficiency that the unit cost of trenching may be decreased from 20 to 30 per cent.

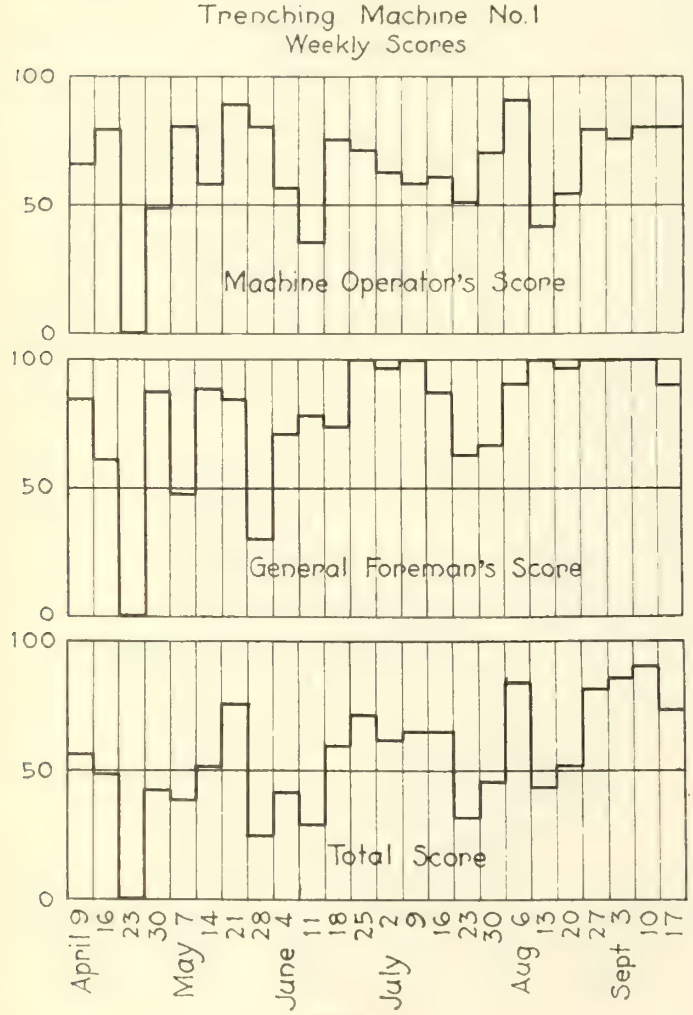

Fig. 2

Many Operations by One Machine

The machine considered in the foregoing paragraphs is essentially a one-purpose machine; but, in the construction department of utilities, there are many operations which, although rather dissimilar, may often be performed by a single piece of equipment. For example, a back-filler now in use by this department has had its load curve greatly benefited by adapting it to several uses. In addition to being a rapid back-filler, it has been used on other work, as follows:—

For unloading cast iron pipe from cars, the costs were reduced 60 per cent.

With bottom dump buckets, deep excavations may be handled more cheaply and the work speeded up as compared with hand methods.

For erecting reinforcing steel and forms in building work, the back-filler made a satisfactory traveling crane.

For pouring concrete in column forms, a special mast and bucket made the handling of the work a simple matter.

The Metropolitan Utilities District has in service a small gasoline-driven drag line which has proven very useful for excavating trenches for large size pipe, for handling pipe while laying, for unloading sand and stone, for unloading and bunkering coal and as a backfiller.

An Ingersoll-Rand air compressor was placed in service about July 1st. While cost data are not available in sufficient detail to be published, it is felt that its purchase was wise.

The compressor was delivered on a steel truck, but it soon became evident that the racking due to trailing behind a truck, over rough pavements, would cause material damage. It was decided to mount the unit on the chassis of an old truck which had been retired from service, and the first plan contemplated the use of the chassis as a trailer. As the mounting progressed, it became evident that, with only minor changes, the unit might be made to be propelled by the engine of the compressor. The space formerly occupied by the engine has been utilized as a toolbox, and all necessary equipment may be carried to handle the various classes of work, without the necessity of providing a truck to aid in moving from job to job.

The compressor has been used in connection with a "paving breaker," to cut paving for the installation of water and gas mains. This paving breaker is a heavy, non-rotating air hammer, using 1½ inches moil point steel, and is very effective in breaking concrete base. A chisel point tool is used for cutting and lifting sheet asphalt, or asphaltic concrete, and the moil point is used for raising brick.

Foundry tampers, to which was added a large foot, were found effective in tamping re-filled material in trenches. One man with this tool was able to do the work of six men with hand tampers and do it better. Where the soil was dry and powdery, it was necessary to moisten the material in order to get it all into the trench.

A jackhammer drill, for use in cutting holes in walls and slabs, and for removal of old foundations, is a valuable addition to the equipment, and chipping hammers are useful in many places.

Cement Gun's Usefulness

A cement gun has been used on two jobs, one of which was especially difficult, due to the desire to obtain a pleasing architectural effect on concrete walls adjacent to pressed brick and cut stone work. As far as appearance is concerned, the work was entirely successful, and it is believed that the stucco will remain permanently in place. Another job was the guniting of the vertical walls of a settling basin, and the compressor has proven satisfactory for the use of the cement gun, as well as for running the chipping hammers and for sand blasting.

When used in connection with a cement gun, a large field of use is opened to the compressor, since gunite cannot only be used for improving the appearance of old structures, but is particularly adapted to the water-proofing of structures designed to be water containers. Undoubtedly many more uses will be found for the compressor as particular conditions arise and it should be possible to get an attractive load curve.

In a period of less than a decade, the urban transport system has been completely revolutionized, the horse-drawn vehicles having almost entirely given way to the automobile, and, while it would not seem to us possible to carry on our business to-day with the former equipment, the writer feels that there is great waste in the utilization of automobile equipment. A great deal of care should be given to the selection of trucks, to obtain economical capacities, body types suited to the work, tire equipment which has a low cost per mile and yet of a design which may successfully travel under difficult road conditions, under the emergency requirements so often imposed in water works operation. But, with all these conditions ideal, considerable losses may occur due to a lack of consideration of its proper utilization. The writer uses a despatcher to order the movements of all trucks, and has found that not only was there less idle time, but material was delivered to the job more neatly at the time it was needed, gangs could be moved at the time they were ready and a truck was always available at some point in the city to handle emergencies. In this connection, the trailer was designed to make rapid thansit of repair tools possible without the necessity of loading and unloading a truck whenever a move was necessary. Since this item of labor was avoided, it was possible to equip the trailer with tools to meet practically all emergencies and make it a much more valuable unit than under the previous plan of loading small tool boxes, derricks, tackle and shovels onto a truck. By the use of a spring-cushioned, rubber-tired trailer, the truck could travel at its normal speed, whereas with the steel-tired wagon trailer, speeds of more than four or five miles per hour would have soon wrecked the running gear, wracked the body and so mixed up the contents of the wagon that tools would have been damaged and rendered useless.

Another item of automobile expense that is generally over-looked is that of unnecessary mileage. The speed of a car makes the long way to a job seem of small importance, allows a return for forgotten tools to be made so easily and makes careless routing a matter that is almost impossible to detect. Probably 15 to 25 per cent auto mileage might be eliminated by consideration of these items.

How to Improve the Load Curve

To summarize the elements which should be considered when endeavoring to improve a load curve, we have:

1. With a "one purpose" machine, it should be so designed to give maximum hours of useful work with minimum time out for repairs.
2. "Multi-purpose" machines should be designed to be adaptable to the maximum number of uses spread as nearly over the entire year as possible.
3. Correlated work should be so organized that the equipment is able to work all possible hours.
4. Supervision should be such that duplication of trips of trucks and possible "empty" or unnecessary mileage are avoided and no other work or men are kept waiting.

Quarry Problems and How to Handle Them

Investigation of Stone Quarries Shows that Inefficient Methods of Operation are Prevalent—Scope for the Employment of a Trained Engineer —Operator Should Apply Engineering Principles

By OLIVER BOWLES
Mineral Technologist U.S. Bureau of Mines
Before National Crushed Stone Association

The United States Bureau of Mines has within its ranks a group of engineers who are engaged in working out quarry problems, the solution of which will be of general benefit to the industries involved. The problems undertaken are approached in a systematic and thorough manner, all the evidence for and against any proposed change or new development being collected as carefully as an attorney would prepare his data on an important case. Unlike the attorney, however, the bureau engineer does not take sides; his judgment is based entirely and impartially on the array of facts presented. In order to gain the desired information he visits many plants, consults with the leaders in the industry, works out experiments in his laboratory, and supplements this information with a study of all available literature already published on the subject in any part of the world. As an engineer who has for eight years conducted such inquiries in the stone industry, I propose to discuss the Bureau of Mines viewpoint; and it may be of interest to consider with me in a brief and general way the engineer's method of looking at quarry problems, and some of the results attained through past and present labors.

While the bureau has conducted no investigation directly for the crushed-stone industries, two years of investigative work at cement-plant quarries, and work now being conducted at lime-plant quarries, has a very direct bearing on the problem of the crushed-stone industry, since stripping, drilling, blasting, loading, and transportation are similar in many respects in all stone quarries. The result of cement-plant quarry investigations are to be found in Bureau of Mines Bulletin No. 160. Two short papers on lime-plant quarry problems have been issued in mimeographed form as Serial No. 2401 and Serial No. 2424.

Quarry Problems

What are some of the problems in stone quarries that the engineer may successfully undertake? The stone trades are peculiar in this respect that at the present stage of development the main problems are not of a type that may be solved in a laboratory. My early training led me to believe that microscopes, test tubes, and chemicals were the necessary equipment for research, but a few years' work around quarries has taught me that steam shovels, scrapers and drills are the tools that must be used. By this I mean that the stone quarry itself is the laboratory, for most of the problems are of such a character that they can be worked out only in actual practice. I believe, however, that as time goes on and greater refinements are developed in quarry work, the use of precision machines in well equipped laboratories will play a greater part in quarry research.

Some problems in the nonmetallic mineral industries that we have approached in the Bureau of Mines and solved with some degree of success are as follows:

(1) A determination of the relative efficiency of steam-shovel and hand-loading methods.

(2) A comparision of the relative merits of cordeau and electric detonators for firing heavy blasts, indicating that the former is the more efficient.

(3) A method of overcoming a condition of "strain" in marble quarries by drilling closely spaced holes, thus permitting slow expansion of the marble and avoiding heavy losses through strain figures.

(4) The development of improved grinding methods for talc and feld-spar; mills recently built in accordance with bureau plans have from the start demonstrated their superiority over other types.

(5) The determination by experiment that pulverized waste slate is an excellent filler for road asphalt and certain other products, thus opening a way for developing a market for a product otherwise wasted.

The Engineer's Mode of Attack

Now what is the engineer's method of approach to a stone-quarry problem, and what are the successive steps that must be followed in arriving at a proper solution? They may be enumerated as follows:—

(1) A clear idea of the exact nature of the problem.

(2) Compilation of data from many plants where the processes under consideration are actually employed.

(3) Review of all data already published.

(4) Laboratory or industrial plant experiments if such are possible.

(5) An analysis of all the facts presented.

(6) A conclusion based on this analysis.

(7) A verification of the conclusion.

A mere enumeration of the steps followed may seem very abstract and indefinite, but I can make it clearer by referring to an actual problem. During the past three years the bureau has devoted much attention to the slate industry, the results of such studies having recently appeared as Bureau of Mines Bulletin 218, "The Technology of Slate." The outstanding problem in this industry is that of waste, for various published reports have stated that waste varies from 70 to 95 per cent of total production. Visits to the slate regions corroborated these reports, for veritable mountains of waste were found. A study of the problem indicated that two lines of investigation were open: (1) Profitable utilization of waste, and (2) reduction in the proportion of waste.

Utilization of Slate Waste

In order to determine methods of utilization all literature on the subject was reviewed and co-operation was obtained from over 40 manufacturers to whom samples of pulverized slate were sent to be tested as filler in such products as asphalt and rubber. The information obtained from these tests was tabulated. The conclusion was reached that slate flour could be used successfully as a filler in rubber, linoleum, window shades, roofing mastic and particularly in road asphalt surface mixtures. It was estimated, however, that even if all uses were developed widely the actual tonnage consumed would probably utilize only a part of the available slate waste. Thus owing to the somewhat restcricted uses for waste slate at the present time a second conclusion was reached, a conclusion of very great importance to slate producers, namely, that greater efforts should be expended in finding means of reducing waste than in developing ways of utilizing it.

With this conclusion in mind the second line of inquiry was followed, that of determining ways of reducing waste. A careful study was made of operating methods in nearly all active slate quarries. It was found that the proportion of waste could be materially reduced by using drills and channeling machines instead of heavy blasting, by cutting parallel with joints and ribbons, by manufacturing a greater variety of products, by making novelties from small pieces, and in other ways. By such studies at least a partial solution of the problem has been found, and a pathway has been opened for further inquiry.

Indifferent Methods are Prevalent

During recent years I have visited about 600 stone quarries. Many of them are highly efficient operations, but on the other hand I find some processes in use that are so crude as those employed in Egypt when the pyramids were built. The employment of inefficient methods is due partly to lack of capital, partly to tradition or to the influence of methods used in surrounding operations, and partly to unusual quarry conditions, but one great outstanding lack is the failure to apply the principles of engineering to the problems encountered. Some problems may require the experience and knowledge of a trained engineer, and he should be called in consultation. In many instances, however, the operator is quite capable of solving his own problems by applying to them two important engineering principles. The first principle is the ability to see both sides of a question, to weigh the evidence impartially, and to dismiss from consideration any preconceived opinion as to the most desirable solution of the problem. The second important principle is the establishment of conclusions on a sound basis of fact. Thus the preparation of positive data is a necessary function of any investigator, and this can be done only by keeping exact records of tonnage and costs. Few economic problems can be solved without using figures, and no quarry-man can hope to solve his problems without the aid of systematic records. Many processes now in use would be abandoned tomorrow if the operator had before him on a sheet of paper a set of figures indicating their excessive cost.

Excellent papers dealing with highway topics are included in the recently published proceedings of the eighth annual conference on highway engineering, held at the University of Michigan, on February 13-17, 1922. The book, which has 268 pages, will be a valuable reference volume for all interested in road location, construction and maintenance, or the economic aspects of highway development.

How May Apprentices be Trained?

Inasmuch as the Lack of Skilled Mechanics is a Serious Problem in Most Lines of Industry, This Article Outlining School and Shop Systems Will Offer Valuable Suggestions

By R. L. SACKETT*

The object of apprentice training is to train a sufficient supply of young men to meet the need for skilled employees, including foremen and superintendents. It is believed that thorough training stabilizes employment, reduces turnover, gives a better understanding of elementary economics as applied to industry, and tends to "create a greater interest in and loyalty to the concern."

A number of developments have occurred within the past year indicating an appreciation of the need for apprentice training. The Industrial Association of San Francisco, for instance, an organization of employers, because of the difficulty in obtaining sufficient skilled labor and the high wages demanded, has been led to establish schools for plasterers and plumbers. They plan to open other schools for bricklayers, steam fitters, carpenters, electricians, and others. Out of 75 who responded to the first call for plasterer apprentices, 25 passed the preliminary tests. During the training period of 12 weeks, the trainees are paid $2.50 per day of eight hours and are taught by skilled workmen. At the close of the course they are put on regular work at good pay, and at the end of a year are to be rated as journeymen.

In training plumbers the plan is somewhat different. The apprentice has two weeks of schooling, then goes as a helper for four weeks on real jobs then returns to the school.

The report says that the association believes that it can train men to be master craftsmen in 12 to 18 months, whereas three to four years have been demanded in the past.

The New York Building Congress Apprentice System

The most extensive program of apprentice training that has been recently developed is one prepared by the New York Building Congress, which is an organization composed of representatives of the architects, builders, and trade unions. A committee on apprenticeship was organized in January, 1922, "in response to a demand on the part of the building industry to develop men better trained in their craft and in citizenship than present-day trade conditions provide or permit."

The Committee states the purpose of the movement as follows:

"The Committee was established for the purpose of fostering the development of the apprenticeship in the building trades, not by dictation, but by acting in an advisory capacity with similar committees from the various interests represented in the Congress.

"The Committee proposes to co-operate with all other committees, organizations, and movements of trade, labor or educational interest, by bringing their activities together and overcoming the difference or inertia that has existed and which has done so much to handicap, if not to frustrate, the best interests of training in the building trades."

The policy and the general plan have been adopted by both the New York Building Trades Employers Association and by the Building Trades Labor Council, representing the unions. The joint plan is in operation and was first applied to woodworking apprentices after the carpenters unions had approved the idea. The general plan of the apprenticeship is for the apprentice to learn his trade on the job and receive his instruction in related technical studies during part-time attendance at school. The intention is to utilize the public continuation and evening schools so far as practicable but where such co-operation cannot be obtained the Congress will open its own schools.

There is sufficient evidence of an adequate supply of apprentices ready for training, and plans are being made for the organization of training for plasterers, bricklayers and other trades as soon as practicable.

This movement by the New York Building Congress has the support of financiers, contractors, and union labor and it has aroused widespread interest in the problem of supplying an adequate number of skilled mechanics and artisans. There is an encouraging sign in the announcement by the Committee that—

"The employers see the need of a constructive and sound system for recruiting skilled help and the unions realize that the trades should be dignified with a true educational merit and background.

"It is proposed to proceed carefully and to develop along other occupational divisions in the Building Trades until the entire field is covered, our purpose being to expand gradually so as to build up a system of good sound training that will not only meet the needs of the business but also provide an educational opportunity for our young men."

Building-trades magazines and a wide variety of associations in other cities have expressed their interest in and have endorsed the plan. It is the most conspicuous development of the year in its line. It marks the confession by employer and unions of a recognized need; it is an outstanding evidence of possible and desirable co-operation and it is an acknowledgement that there are educational methods which will expedite the preparation of skilled men.

Railroad Apprenticeships

The railroads have been from the first strong advocates of an apprentice system. They have two classes, namely, those having a common-school education, and those who have been graduated from a technical college.

Those with a common-school education are given class work in mathematics, mechanical drawing, physics, and elementary mechanics along with their shop work.

Those who have a technical education are put on more advanced repair, maintenance, design and construction—principally in the motive-power departments.

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*Dean of Engineering, Pennsylvania State College, before the American Society of Mechanical Engineers.

The pay of apprentices on railroads has been increased until it represents a fair wage.

Industrial Apprenticeship

In 1918 the Westinghouse Electric and Manufacturing Company, of Pittsburgh, added an apprentice drafting course to its educational work. The course consists of two years of eight terms of three months each. The class periods are two hours in length and classes meet three periods per week. The following information was received, which will make clear the object and methods employed by a company which has conducted shop and apprentice training for many years.

The entrance requirements specify high-school graduates or the equivalent.

The apprentices spend the first few weeks in the educational department where they are given a very intensive course in tracing. They are then transferred to one of the drafting divisions where they remain for the first year, after which they are transferred to the shop and scheduled through the pattern, foundry, forging, machining, and assembling departments for the next six months. This enables them to acquire the actual shop experience so essential to designing. After completing their shop experience they are brought back to the drafting division for the remainder of the course.

The terms in general cover objects of drawing, drawing system, hand and machine tools, patternmaking and molding, shop practice, materials and their application in manufacture, development and sections, and clearances and allowancec. The mathematics in the course range from the fundamentals of arithmetic to the strength of materials in concrete problems. It might be well to mention the fact that the aim is first to make men, and that the various processes are accordingly used to instruct the boys, rather than to teach the processes.

When the course is completed, the graduates are transferred to the engineering department as regular employees.

Fifty-two apprentices have been enrolled in the course at this writing. Twenty of this number are still with the company, making the total turnover from the very beginning of the course, four years ago, only 61.5 per cent. Eleven have been graduated and three of their number have entered college. The remaining eight are still in the drafting office. Ten left the course on account of remuneration and three of them have returned. Of the twenty remaining with the company, six have been there over three years; five others have been there over two years, and the remaining nine have been there over one year. Only one of the total number was discharged.

The company also has apprentice courses for machinists, toolmakers, foundrymen, patternmakers, electricians, and junior engineers.

The applicant for trades training is interviewed by at least two different individuals and is given a simple test in mathematics. Those accepted are placed on probation for a period of three months. Their record is checked monthly by a trades apprentice committee and at the end of three months a definite decision is made as to whether an agreement shall be entered into between the young man and the company. If the young man and the company desire, a contract is entered into at this time outlining the obligations and duties of both parties. The apprentice is then placed in a special department in the factory where he receives preliminary instruction by specially qualified instructors. Supplementing the shop work each apprentice reports to the trades school four hours each week, two hours of instruction being devoted to blueprint reading and mechanical drawing, including tool design; and the remaining two hours divided between shop problems, economics, science, and manufacturing operations.

The National Metal Trades Association

This association also has an apprentice-training system which has been in operation for several years at different plants. It maintains an educational director who devotes his time to the study of apprentice training and shop instruction.

The Committee on Industrial Education of this Association says:

"Investigation in the metal-trades industry has shown that while in normal times there is a fair supply of semi-skilled specialists, there is always a dearth of skilled, all-around craftsmen. These highly skilled men are not only indispensable in the shop, but it is to this group that industry must look for its future foremen, superintendents and managers, and for practical designers and engineers.

"So pressing has this need become, that serious thought must be given to methods of adequate training of young men for this purpose if we would stimulate and not stifle the fullest development of American industry.

"Mindful of its urgency and realizing the consequences which must follow continued indifference toward this important question the National Metal Trades Association, after an exhaustive survey of the situation, has prepared a plan of apprentice training which, with slight modifications, will adapt itself to a shop of any size."

The association has adopted a standard form of indenture, setting forth in full and clearly all the details of compensation, service and training. Provision is made for a probationary period of three to six months, and by examination an apprentice who has had additional schooling may reduce the period of apprenticeship. Wages paid vary with the progress of the trainee, ranging from 33½ per cent to 85 per cent of a journeyman's wages.

An interesting provision is made by which a highly specialized plant may send its apprentices to another plant for part of their training. This is a new type of "co-operative training;" in this manner they obtain the best instruction available in a group of industries.

Careful records are kept of each apprentice and his progress in learning each process. Each instructor grades each man on such qualities as speed, accuracy, etc., as well as on his skill on the particular process. The final record card shows the details of the four-year course, the time used, grade and instructors' estimate of personal qualities. The entire scheme is carefully planned and recognizes the rights and duties of the apprentice and of the company.

To a questionnaire sent out by the National Metal Trades Association, 572 replies were received. Of these 146 stated that some method of apprenticeship was being used, 72 train their operators, and 68 conduct foreman training classes. Of those training apprentices, 81 use the method of casual training by foremen, workmen, or by observation and practice, and 49 have definitely planned systems of instruction either in the production department or in an independently organized training division.

Shop Training

During the world war, various quick methods were adopted for training men for jobs with which they were more or less unfamiliar. Most of the methods had been used in industry for some years, but neither so extensively nor so intensively as in war work. Out of the experience of peace and war have come certain well-defined methods of training men for new jobs. These may be classed as:

1. Vestibule schools, where the training is in an independent organization and not in the production department.
2. The shop school conducted within the production department. This instruction may be by classes, by groups, or by special instruction for works clerks, routing clerks, and others of whom there are only a few in any plant even though it be large.

Vestibule Schools. There is no uniformity in the use of this term. It will be used here to define that type of training conducted in a separate shop where the trainees are segregated from those on production. Here it is proposed to give the "one best way" of doing a certain operation under good conditions. Learners are not distracted by the comments of other workmen. They do not learn the wrong way. They do not take the time of a foreman from production. They do not waste so much material.

On the other hand, a separate training department is not justified in the average small plant, but only where the demand for new, trained men is fairly constant and considerable. The separate school depends on the production department to absorb its output and if there is not close co-operation between the two, the separate school will be unsatisfactory.

The instruction often consists of one or two periods per day of classroom work and the remainder is spent on the process or operation to be learned.

The instructors should be chosen from the skilled men in the production department who have the ability to transmit what they know and tact in doing it. The production department will naturally object to losing one or more of its most valuable men for this purpose.

Shop Schools when conducted in the production department have the advantage of a certain elasticity. Instructors not required at the time can be put back on production. The majority of plants employ this method, and the foreman is most frequently the teacher. The modern demands on the foreman are much more severe and exacting than they used to be. To ask him to be a teacher also is a questionable expedient except where the number of trainees at one time is small. Where the plant expects foremen to be teachers, it seems reasonable to instruct them in methods of teaching.

The instruction is usually for the sole purpose of increasing the immediate productivity of new employees, saving waste of materials, and reducing wear and tear on machines. The training of apprentices is much broader and includes more of the industrial and economic background of production. The Federal Board for Vocational Education, in Bulletin No. 48, urges the importance of teaching in shop schools, the character of and sources of the materials used, the general processes of manufacture, the purpose and principles of planning and routing, the definition of terms frequently used, reading blueprints, job tickets, safety, welfare, hygiene, and the elimination of waste.

Wages During Training Period

In a plant where piece rates prevail a beginner will often become discouraged and quit before he has learned the process and become sufficiently skilled to make a reasonable wage. It is usual to provide a special day rate during the period of training so that the trainee will be assured of a certain minimum income until he has the skill necessary to earn a higher wage on a piece-rate basis of payment.

Another method is to give the trainee a bonus, during the learning period, on the regular piece rate, depending on the production reached. If he does not accomplish the minimum production set he has the fixed day rate, and if he reaches or exceeds the minimum production he receives a bonus on the piece rate.

Where contracts are let to a group to construct or erect parts or the whole of a complicated machine, the cost of instructing a new man is sometimes borne by the group as a part of the total cost or contract price.

Where a group of workmen in a particular shop are held responsible for the instruction of new men, a leader is appointed who sees to the supply of tools, materials and the set-up of machines. The earnings of the leader may be charged to overhead, but enter into the cost of the job in that shop. In this manner the earnings of the group and of the individual are affected only by the time given by each man to instruction and not by the loss due to the reduced production of the leader.

A record card is kept of each learner, giving the time required to master each machine or process, the production output, and comments of the instructor or foreman on the progress of the learner. The time card also gives valuable information as to the capacity of different men to teach—or the indifference.

Difficulties in Shop Training

The old method of having the foreman "break in" the new men presumed some knowledge of the job by the employee and was in vogue when the foreman's job was much simpler than now. Because of this custom and the desire of some foremen to continue this duty, it is difficult to convince the management of the desirability of having trained teachers, i.e., men of skill who have been instructed how to teach. Too frequently a man is chosen to teach just because he knows the subject. Very often one who is not an expert becomes a better teacher because he has the gift or has been trained in the process of teaching.

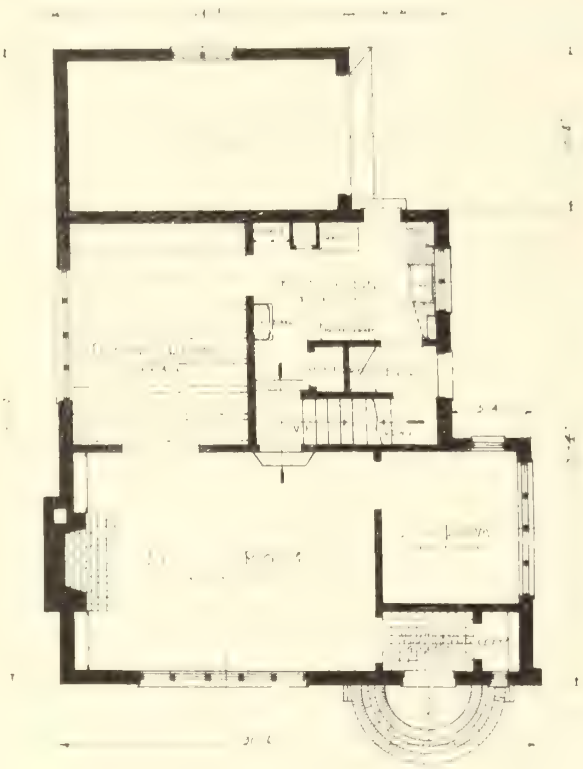
Experience has demonstrated that assigning to the teaching an assistant foreman who has been trained to teach, or a selected workman who has the qualities of a teacher, is economy. In other words, the organization of teaching is important, and is increasingly important as the number of trainees increases.

The expense of maintaining trained instructors who are non-productive is frequently an objection in the eyes of the management. It is difficult to show by figures the reduced time and materials used in learning, the saving in wear and tear on machines, the saving in the foremen's time, the reduced turn-

(Continued on page 335)

The Contract Record's

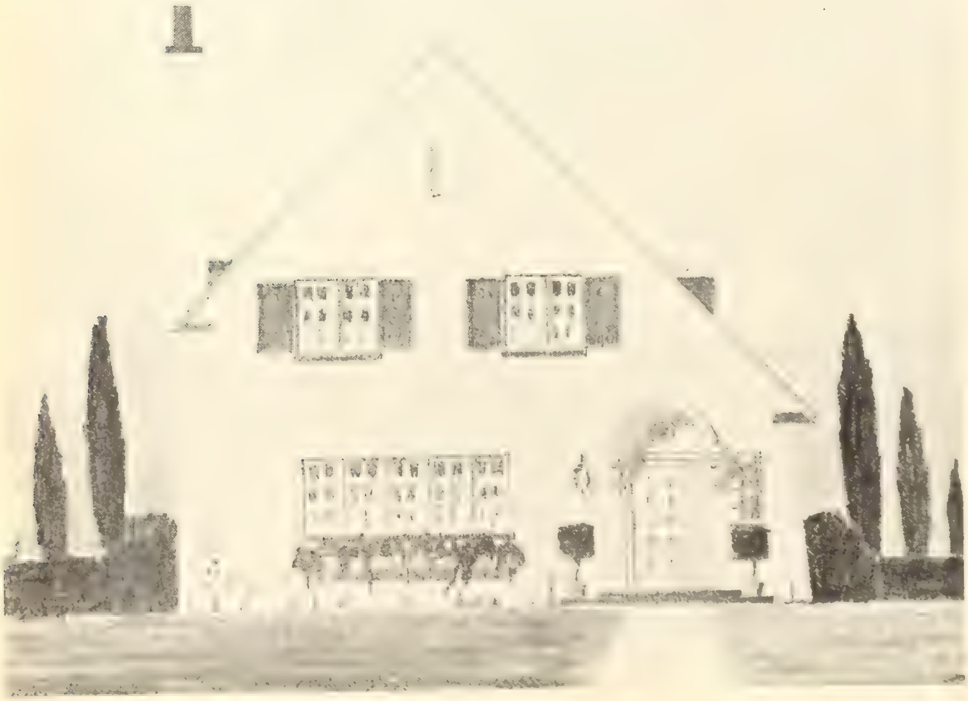
Weekly House Suggestion No. 63

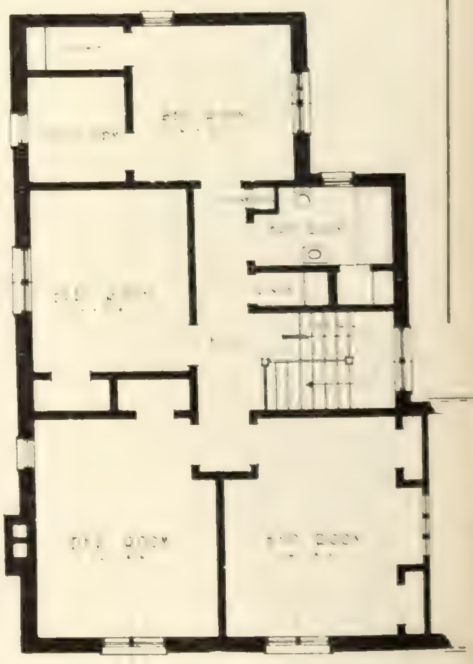


Our subject this week is a very pretty home which is to be erected for Mr. W. H. Robinson, at London, Ont. The walls will be of Cooksville shale brick, painted with Cabot's Old Virginia white paint, and the shutters, lattice over the small window at the front and flower box will be painted French green. The entrance hood, door, sash, etc., are all to be finished white and the roof shingled, with varying exposures, from 7 in. at the eaves to 3 in. at the ridge, the shingles being creo dipped, laid in waving lines and stained in three shades of brown. The entire exterior will doubtlessly produce a very charming effect.

There is a beautiful large living room and dining room shown in the ground floor plan reproduced herewith. The entire main floor will be trimmed with chestnut stained walnut and the dining room walls will be in rough plaster with exposed rafters and under floor, all stained. The upstairs trim will be finished in Alba gloss enamel. The windows throughout will be of the casement type, opening out. The heating systems will be of the hot air type.

Mr. Walter Stuart Pavey, architect, of 380 Richmond St., London, Ont., is the designer of this very attractive house.





Second Floor Plan

How May Apprentices be Trained?

(Continued from page 333)

over during the training period, the lessened interference with production, and the greater satisfaction to piece workers when they are not asked to break in new men.

Good instruction insists on doing the thing in the right way, and then learning to do it as fast as possible by correct methods. Production insists on doing the work as fast as possible, though the methods pursued may not be the best and ultimately may not lead to the greatest possible production commensurate with the effort made. There is a natural conflict between good instruction and the purposes of the production department which is not given due weight. It has been found that those who have received a thorough apprentice training often make good teachers because they have been thoroughly trained and have learned in the logical order, i.e., they have been given the simplest jobs first, then the more complex, while the desire to obtain early production may lead to an illogical order in the instruction of a new man and a waste of time.

Selection of Men

Another difficulty arises from the fact that in many plants there is little attempt to select men who are adapted to the job. An increasing number, especially of the larger plants, select both apprentices and skilled workmen (or those who are to be trained in some process requiring skill) with care. Educational tests of a simple character are given applicants for apprenticeships and systematic questions tending to establish fitness or unfitness are being applied to mature applicants. Trade and psycholigical tests were applied during the war and a valuable body of information and experience was gathered. There is much that is sound, and when turnover costs from one hundred dollars per man to twice that, it seems the part of wisdom and economy to apply discriminatory tests to all applicants, keep a simple rceord, and test the efficacy of such tests by experience. There are numerous sources of information on this subject such as the bulletin of the National Personnel Association, The Instructor, the Man and the Job, by Charles R. Allen, and various journals on applied psychology, management, etc.

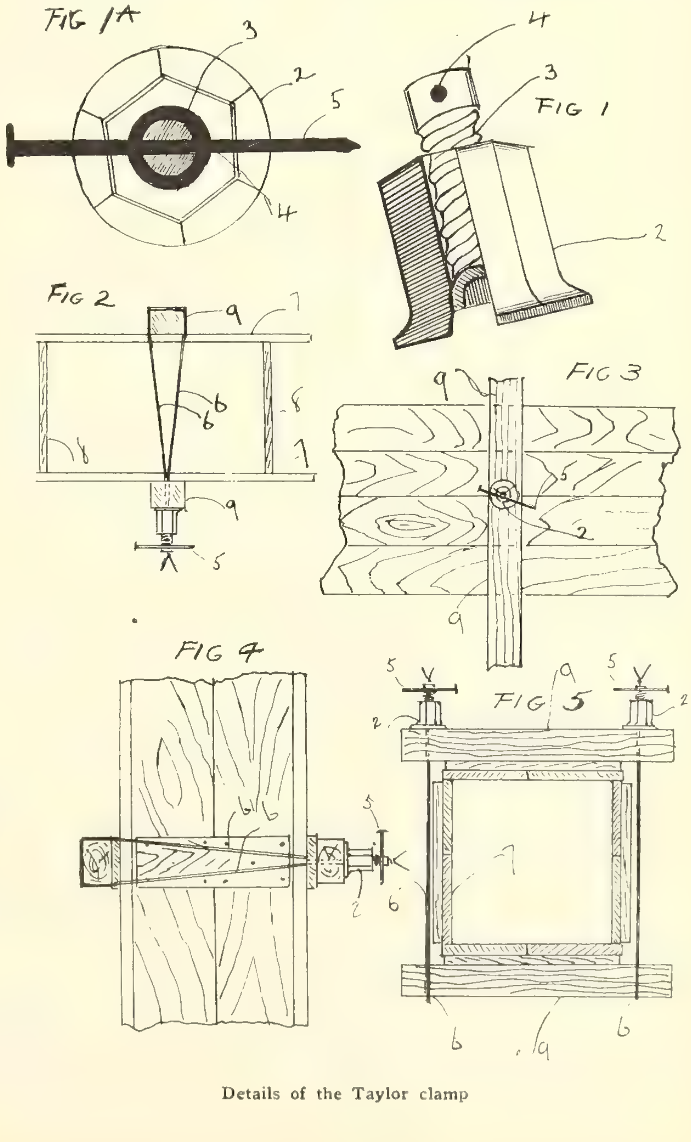
In conclusion, it is safe to say that whether the shop training should be done in a separate department or on the production floor depends on the size of the plant, normal turnover, complexity of the job to be learned, and other factors. In any case more attention should be given to organizing the instruction, selecting those to be trained with more discrimination, selecting instructors because of their skill as workers and as teachers, and so arranging the instruction as to give the new employee the best information available about his job, the methods, materials, and machines used. Some day we shall realize the importance of giving him a reflection of company ideals, methods of recognizing ability, faithful service, and loyalty. Perhaps industry will see the wisdom, even economy, of teaching its younger men the fundamental principles upon which a sound future industrial policy must rest. Up to the present time industry has had very few ideals, with marked individual exceptions, and such ideals as it may have had have been carefully locked in the safe rather than spread among the employees.

Machinery & Equipment

Clamp for Wiring Concrete Wall And Column Forms

The drawings with this article show a small patented malleable or cast iron device which is used to tighten up and secure wires used in concrete wall forms. It can also be easily improvised to take the place of expensive column clamps as generally used. The ordinary method used in wiring wall forms, for instance, is to pass two wires through the sides of the forms and twist the ends together. After the forms are complete carpenters go down inside the wall forms and with a piece of iron bar or a screwdriver keep on twisting the wires till the required thickness of wall is obtained or the forms are drawn tight against the wood spreaders. One can readily understand that the wires are often over twisted and the strength partly destroyed, so that when the soft or mushy concrete is poured they give way, which often means a shut down or a resulting thickening of the wall with the expensive job of hacking off when the forms are taken down later.

The appliance which is illustrated really needs very little explanation as regards its placing and use.



Details of the Taylor clamp

When building walls the wire is looped over one of the vertical braces, or in the case of horizontal walings the same way; the two ends of the wire are carried through a quarter inch hole which is bored through the vertical or horizontal stud or brace on the opposite side; the two wires are passed through the patented clamp; a spike or nail inserted in the hole at the end of screw part, and the two wires are given a couple of twists to secure them. The spike is grasped in one hand while with the other the outer hexagon nut is revolved with a spanner or wrench. The revolving of the outer nut causes the screw to extend or lengthen with the result that the wires are powerfully drawn tight and secure, the full strength of the wire being used without the usual fibre destroying methods as now used. As a labor saver, which is primarily the first consideration these days, little need be said, as a glance will show that.

The inventor, who has acted in the capacity of general superintendent of reinforced concrete work for a number of years has always found that the wiring of forms was one of the most uncertain operations in this work. When labor was cheaper, of course, the extra time was perhaps not so noticeable. By the old way it was an extremely awkward job for a carpenter to crowd down into a narrow wall form to twist up the wires inside, he taking often as long as ten minutes' time on one set of wires. With this new method a laborer or helper can go along putting wires through clamps and tightening them quite easily.

To avoid boring a hole through studs or walings the inventor uses a piece of one by two batten with a saw cut to allow two wires to pass. With this method wires can be carried outside of studs or walings. The small block serves to keep the clamp far enough away to let wires pass inside and through same. When the wires are outside the studs this saves labor in boring holes and is just as effective. The gauge of wire mostly used by contractors is 12 to 14. In the case of very heavy walls a slightly heavier clamp is used with also heavier wires.

In using the appliance for clamping up column forms the wire is looped over the short 4 x 4 pieces and passed through a small hole bored in the opposite piece and clamped as before. The heavy wires used can be re-used on the next floors as generally columns are reduced on successive floors. There are, of course, dozens of methods and contrivances on the market, such as bolts or rods running through the concrete and secured by nuts or clamps, etc., but the ordinary contractor can not see any spectacular savings. How many contractors have been heard to say, "I can mix and pour concrete and have perfect control and knowledge of costs, but with "form-work" you never know how you are coming out." Any inquiries can be addressed to the patentee, Mr. Charles Taylor, 80 Roehampton Ave., Toronto, Ont.

Personal

Mr. Walter Boughner has been appointed to succeed Mr. W. J. Lindsay, deceased, as road superintendent of Malahide Township, Ont.

Trade Incorporations

Disher Steel Construction Co. Ltd., capital $500,000, head office at Toronto, to carry on the business of builders, structural steel workers, etc.

Mainly Constructional

East and West—From Coast to Coast

Mr. A. Mercure, architect, has moved from 103 St. Francois Xavier St. to 713 Mount Royal Ave. E., Montreal.

The contract for the foundation work on a two and one-half million bushel addition to the Saskatchewan Co-operative Company's elevator at Port Arthur, Ont., was awarded to the Thunder Bay Harbor Improvement Company recently.

The Canadian Insulation Co. Ltd., of Selkirk, Man., manufacturers of the product Seal-O-Felt, an insulating material for building purposes, have decided to add another unit to their plant this year. This compnay's product was used for lining 200 houses erected in Winnipeg last year.

A new firm, the Tavistock Building & Mfg. Co. Ltd., Hope St. W., Tavistock, Ont., are taking over the business of H. W. Kalbfleisch & Sons and will add a woodworking department.

The Rogers Supply Co. Ltd., dealers in builders' supplies, at Toronto, are moving their offices from 28 King St. W., to the new General Accident Assurance Building, at the corner of Bay and Temperance Streets.

A recent news item is to the effect that the differences between the Public Works Department at Ottawa and Mr. John Pearson, architect for the new Parliament Buildings, over remuneration for the latter's design of the Peace Tower, over the main entrance to the buildings, have been settled and construction work will be carried on to completion this summer, under the supervision of Mr. Pearson.

Plans for a $100,000 traffic bridge over the Assiniboine River, between Charleswood and St. James, Man., were submitted to the Winnipeg Public Parks Board, at one of its recent meetings. It is not known as yet whether the government will be asked to support the erection of this structure this year or not. Unless the other municipalities interested press for action this year, Winnipeg will not do so.

Toronto carpenters are out after a wage increase from the existing rate of 90 cents to $1.00 an hour. A committee was appointed at a recent meeting to negotiate with the Builders' Exchange for this advance in wages.

The city council of Belleville, Ont., recently decided on the improvement and extension of the city's water works system, this work to include the laying of a new intake pipe, 30 in. in diameter, complete with suction wells, a filter system and the necessary buildings for housing wells and pumps. One high-lift gasoline drive pump will also be installed at an early date. The cost of these improvements will be in the neighborhood of $100,000.

The ratepayers at Lakeview, Ont., have authorized the selling of debenture bonds to the extent of $50,000, for financing the construction of a new school.

It has been announced that an immediate start will be made on the construction of a large apartment building to be known as the Drummond Court Apartments, on a site between the Y.M.C.A. building and the New Drummond Apartment House, Drummond St., Montreal. This new building will have 150 apartments, will be of fireproof construction and thoroughly modern in every respect. The site is 249 by 253 feet.

The general contract for the building of the new Lorne Bridge at Brantford, Ont., has been let to the Port Arthur Construction Company, Toronto, at $260,300. This figure represents the cost of the bridge proper and does not include expenditure for paving, railing and other incidentals, estimated by the engineer to cost $74,345, bringing the total cost to $334,645.

CONSTRUCTIONAL ACTIVITY

Period of March 28 to April 3, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Alymer, Ont.
10 inch vitrified sewers contemplated by the Town Council. W. E. Steurst, engineer.

Bonaventure, Que.
Under the supervision of Edouard Poirier the Town Council will gravel a road at a cost of $3,800. Chas. A. Forest, secretary. Tenders will be called around the first of April for a concrete sidewalk estimated to cost $1,200.

Two gravel roads, costing $4,000 each, contemplated by the Town Council. Chas. A. Forest, clerk.

Cap Chat, Que.
The Provincial Government, Department of Public Works, plans to build ten miles of road at a cost of $16,000. J. R. Roy, Cap Chat, interested.

Charlottenburg, Ont.
Tenders on three miles of crushed gravel road from the 5th concession to Glen Roy Road will be called by the Township Council early in April. Tenders will also be called on two miles of widening and grading on the Johnston road north of Williamstown. W. T. Bailey, Williamstown, clerk.

Chatham, Ont.
Pavements on three streets are planned by the City Council. C. H. R. Fuller, engineer.

Clateauguay Bassin, Que.
Pavement costing $15,000 will be laid by the town. V. Tardiff, mayor.

Cornwall, Ont.
Road costing $100,000 contemplated by the Town Counicl. J. G. Harkness, clerk.

Elora, Ont.
Permanent pavement costing $55,000 planned by the Town Council. Reeve U. Richardson, Chairman of the Committee.

Glengarry County, Ont.
Early in April County Council will call for tenders for four or five miles of waterbound macadam. J. R. Simpson, Cornwall, clerk.

Tenders for three miles of waterbound macadam road will be called early in April by the County Council. J. R. Simpson, Cornwall, Ont., clerk.

Hespeler, Ont.
Sidewalks and road oiling contemplated by the town. Mr. Panabaker, mayor.

Leamington, Ont.
Pavement contemplated by the Town Council. J. J. Newman, Davis Block, Windsor, engineer.

Medora Twp., Ont.
Council of Medora and Wood Twps. plan road improvements costing $12,000. G. R. Jestin, Torrance, Road Superintendent.

Mimico, Ont.
Town Council contemplates an extension to a street at a cost of $5,000. C. J. Telfer, clerk.

An eight inch sewer, costing $2,600 contemplated by the Town Council. C. J. Telfer, clerk.

Niagara Falls, Ont.
Tenders on a parapet wall are being received by J. H. Jackson, Park Superintendent, until April 7.

North York Twp., Ont.
Tenders for waterworks are being received by H. D. Goode, Lansing, Ont., until Apr. 14 as follows: Supplying cast iron pipe; supplying hydrants and valves; laying mains; supply and erection of elevated tanks; construction of pump house, filter plant and dam; supply and installation of filter equipment; supply of pumping machinery; supply of cast iron specials.

Pickering, Ont.
A cement sidewalk, costing about $4,000, proposed by the Town Council. Cement to be purchased. J. R. Theston, clerk.

Pointe au Pic, Que.
Provincial Government contemplates improvements to macadam and gravel road. L. Warren, mayor.

Price, Que.
This summer the Town Council proposes to build an aqueduct costing $50,000. Art. Michaud, secretary.

Province of Ontario.
Province of Ontario has awarded additional contracts for 1923 roadwork. Further details given on page 321.

Ste. Anges Parish, Que.
One half mile of gravel road costing $1,000 contemplated by the Town Council. A St. Hiliare, secretary.

St. Leonard, Que.
Town Council proposes to build an earth road at a cost of $12,000.

St. Louis de Kamouraska, Que.
Gravel road estimated to cost $3,000 proposed by the Town Council. Geo. Drapeau, secretary.

Ste. Marie Madeleine, Que.
Two and a half miles of gravel road costing $12,000 contemplated by the Town Council. F. X. Coderre, secretary.

St. Nazaire D'Acton, Que.
Two miles of gravel road contemplated by the Town Council will cost $6,000. L. G. Daigneault, secretary.

Ste. Therese, Que.
Sewers costing $80,000 are being discussed by the Town Council which will have to vote a regulation before proceeding with this project.

St. Valentin, Que.
About May 1 Howick Paving Co., Howick, will commence work for the Provincial Government costing $15,000.

Tisdale Twp., Ont.
Pumping plant and water supply contemplated for South Porcupine will cost $250,000. J. F. Henderson, Timmins, Ont., engineer.

Toronto, Ont.
City of Toronto wants tenders on sewers until April 10. Plans and specifications at Room 6, City Hall.

Victoria, B. C.
David Spencer Ltd., Victoria, wants tenders on a tunnel to connect store with an arcade. Percy Fox, Brown Bldg., architect receiving the tenders until April 7.

Vercheres, Que.
Alf. Bouvier will supervise the laying of a $12,000 macadam bituminous pavement for the Town Council. M. Laporte, secretary.

CONTRACTS AWARDED

Bear River Bridge, B. C.
G. Elstrom, Stewart, B. C., has the general contract for an embankment for the Provincial Government which will cost $14,000.

Hamilton, Ont.
Webster Construction Co. Ltd., Bank of Toronto, London, has the general contract for sewers for the city at $24,000.

Middlesex Co., Ont.
Contract for concrete pavement 27 feet wide awarded by the County Council to Boss & Brazier, 703 Waterloo St., London.

Vancouver, B. C.
A. B. Palmer Co. Ltd., 736 Granville St., have been awarded the general contract for 8½ miles of road for the Provincial Government costing $248,000. Company will require a concrete mixer.

Railroads, Bridges and Wharves

Chicoutimi, Que.
At a cost of $29,500, allowed for in this year's estimates, the Dominion Government plans to rebuild a wharf and shed. R. C. Desrochers, Ottawa, secretary .

Contrecoeur, Que.
Dominion Government will reconstruct the headblock of wharf at cost of $5,-

000. This item was included in the 1923 estimates. R. C. Desrochers, Ottawa, secretary.

Cross Point, Que.
Repairs to a wharf, included in 1923 estimates at $3,030, contemplated by the Dominion Government.

Elma Twp., Ont.
Plans are being prepared for the Township Council, secretary, G. Lochead, Atwood, for a steel and concrete bridge, costing $25,000. E. D. Bolton, Listowell, engineer.

Father Point, Que.
Dominion Government may make repairs to the wharf costing $5,500. R. C. Desrochers, Ottawa, secretary.

Grand River, Que.
Contemplated extensions to a wharf by the Dominion Government will cost $29,000.

Grosse Roche, Que.
Dominion Government plans to repair the wharf at a cost of $3,500. R. C. Desrochers, Ottawa, secretary.

Haileybury, Ont.
Dominion Government has commenced rebuilding a wharf at a cost of $26,400. R. C. Desrochers, Ottawa, secretary.

Havelock, N. B.
Provincial Government is receiving tenders for a bridge until April 11.

Lameque, N. B.
Repairs to a wharf to be made by the Dominion Government will cost $6,000.

Leamington, Ont.
Paving 1½ miles of track, 84 inches wide, contemplated by the Windsor, Essex & Lake Shore Rapid Railway. Mr. Clayton, manager, Kingsville.

L'Islet, Que.
Dominion Government has included $23,500 in 1923 estimates for repairs to a wharf.

London, Ont.
London Street Railway contemplates laying new rails at a cost of $15,000. C. B. King, manager.

Miminugash Harbor, P. E. I.
$2,900 provided by the Government in the 1923 estimates for the reconstruction of the breakwater. R. C. Desrochers, Ottawa, secretary.

Oakville, Ont.
Tenders for a reinforced concrete bridge and grading approaches are wanted by the Toronto-Hamilton Highway Commission, University Ave., Toronto. S. A. Cummiford, secretary. Closing date for tenders is April 24.

Petit Rocher, N. B.
Repairs contemplated by the Dominion Government to a breakwater will cost $4,500. Included in 1923 estimates.

Ste. Maleleine, Que.
A wharf costing $15,000 to be built for the Town Council. Rev. Frs. Thibault, interested.

Ste. Marie Madeleine, Que.
Town council considering the building of a bridge. F. X. Coderre, secretary.

Sherbrooke, Que.
Widening the railway viaduct at a cost of $17,100 will proceed in April. T. Tremblay, engineer.

Southport, P. E. I.
Dominion Government has allowed $3,000 in the 1923 estimates for repairs to the wharf.

Sully, Que.
Provincial Government, Department of Colonization, Quebec, will build a wooden bridge at a cost of $1,200. F. N. Boucher, Sully, secretary.

Tignish Harbor, P. E. I.
The Dominion Government may make repairs to the breakwater costing $2,700.

Varennes, Que.
A $2,000 concrete bridge proposed by the Town Council and work will probably proceed this spring. A. Langlois, secretary.

CONTRACTS AWARDED

Brantford, Ont.
Port Arthur Construction Co., Excelsior Life Bldg., Toronto, has been awarded the general contract for "Lorne Bridge" at $334,645.

Coverdale, N. B.
Judson A. Cleveland and Herbert Butland, Alma; N. B., have the general contract for a bridge for the Provincial Government.

Ford City, Ont.
Considine & Reid, Merchants Bank Bldg., Windsor, have the general contract for a dock for the Ford Motor Car Co.

Lachute Subdivision, Que.
The Dominion Bridge Co. Ltd., Lachine and Canadian Bridge Co., 10 Cathcart St., Montreal, have the contract for steel for bridges to be rebuilt in this subdivision at a cost of $350,000 by the C. P. R.

Lambton County, Ont.
Alf. Kirkpatrick, c/o J. A. Huey, clerk, Sarnia, has the contract for a cement substructure for a bridge at $9,800.

The contract for the substructure for a $20,000 bridge in Lambton County awarded to A. Kirkpatrick, Petrolia. Sarnia Bridge Co., Sarnia, has the contract for the superstructure.

Riviere Verte, Que.
About May 1, H. Morin, Trois Pistoles, Que., will commence work on a $15,000 steel bridge for the Town Council.

Public Buildings, Churches and Schools

Alexandria, Ont.
Dominion Government contemplatees a $25,000 Post Office. R. C. Desrochers, Ottawa, secretary.

Arnprior, Ont.
J. A. Ewart, Jackson Bldg., Ottawa is receiving tenders for the addition to the High School until Apr. 15. Plans include four rooms costing $45,000. M. A. Graham, secretary.

Beamsville, Ont.
Board of Education contemplates a $40,000 High School. Harry Prudhomme, chairman.

Brantford, Ont.
F. C. Bodley, Temple Bldg., is receiving tenders on a $35,000 church for the Methodist Congregation.

Bronte, Ont.
Bulk and separate tenders for the $40,000 schoolhouse will be received by Smith & Wright, 2945 Dundas St., Toronto, until April 6.

Clinton, Ont.
Plumbing and heating contracts for alterations to a building for an hospital awarded to Sutter & Perdue at $7,000.

Coldwater, Ont.
The board expects to commence work on the $12,500 continuation school about Apr. 15. Architect not yet appointed. Mrs. T. Gray, secretary.

Cornwall, Ont.
Tenders for the $100,000 addition to the High School will be received by the secretary of the School Board until April 16. R. McG. Nicholl, chairman.

Ennismore, Ont.
Bulk tenders for all trades except mechanical for a $60,000 church being received by the architect, A. W. Holmes, 79 St. Joseph St., Toronto, until April 10.

Fredericton, N. B.
University of New Brunswick, College Hill, contemplates adding an hydraulic laboratory with a probable expenditure of $15,000.

Hamilton, Ont.
Tenders for Hamilton Collegiate will be called by the board about April 9 and close two weeks later.

Hull, Que.
Brodeur & Pilon, Hotel de Ville St., have prepared plans for an addition to a school for the school commission which will cost about $85,000. Jos. Provost, secretary.

Ile Bizard, Que.
Tenders for a new building are being received by the School Commission until April 20.

Montreal, Que.
University Club, 183 Mansfield St., will make alterations to their clubhouse at a cost of $15,000. A. F. Byers & Co. Ltd., 340 University St., are the general contractors.

North Bay, Ont.
Extensions may be made to the offices of the T. & N. O. Railway Commission, Regina St at a cost of $20,000. Geo. W. Lee, chairman.

Oakville, Ont.
Plans for a $49,000 High School are being prepared for the School Board. Wm. Busby, chairman. Wm. Connery, architect.

Pickering, Ont.
Alterations and additions to the school owned by S.S. 4, West Pickering, will cost the board $20,000. Tenders will be

called shortly. S. J. Spall, Whitby, architect.

Puce, Ont.
Trustees of the Presbyterian Church will erect a building costing $13,000. Cameron & Ralston, Bartlett Bldg., Windsor, architects.

Riviere du Loup, Que.
About April 15 work will commence on the $25,000 Public Hall. Rev. J. F. Thilodeau purchases all material.

St. Georges, Que.
Monastery costing $80,000 will probably be built for the Sisters of the Good Shepherd.

St. Thomas, Ont.
Plans are being prepared for a market building to cost about $55,000. W. C. Miller, City Engineer.

Seneca Twp., Ont.
S.S. 13 is calling for tenders on an $8,000 building. R. E. Young, R. R. 1, York, Ont., secretary will receive tenders until April 17.

Sturgeon Falls, Ont.
Plans and specifications for the proposed $10,000 Fire Station are with L. E. Carter, architect, who is receiving tenders until April 10.

Toronto, Ont.
Tenders for wrecking a building for St. Monica's Church are being received until April 7. Sproatt & Rolph, 36 North St., architects.

Plans are being prepared and tenders will be called about April 15 for Roncesvalles car barns costing $250,000. Tenders will also be called this spring for an addition to barns on Connaught Ave.

Canadian National Exhibition, Lumsden Bldg., contemplates an Engineering Building. John G. Kent, General Manager.

Congregation of High Park Methodist Church is having plans for a $75,000 Sunday school prepared by F. E. Belfry, 438 Runnymede Road.

Truro, N. S.
Railway Brotherhood, Truro, contemplate a Labor Temple costing $40,000. J. R. Fisher, Truro, interested.

CONTRACTS AWARDED

Port Dalhousie, Ont.
Rowden & Hookey, 51 York St., St. Catharines, have the contracts for excavating and masonry for the addition to the school. W. W. Parks, 49 Queen St., has the roofing and carpentry contracts.

Quebec, Que.
Contract for masonry and granite for the addition to St. Malo College let to Ed. Belanger, 24 Lalibertie St., at $73,769. F. Gingras, 34 St. Antoine St., has plumbing and heating contracts at $15,310. Eastern Canada Steel Co. & Iron Co. Lessage Ave., have the structural steel contracts at $15,560. E. Falardeau, 141 Dorchester St., has the roofing contract at $2,315.

St. Hyancinthe, Que.
Contract for electric dumb waiters for the hospital awarded to Otis Fensom Elevators Co., St. James St.; LePage Marble Works has the contract for marble & tile.

Terrebonne, Que.
MacKinnon Steel Co. Ltd., Sherbrooke, have the contract for steel for the post office. R. C. Wright, Hunter Bldg., Ottawa, architect.

Toronto, Ont.
Toronto Transportation Commission has awarded contract for Art stone for the Davenport shops to Peerless Artificial Stone Co., Coxwell Ave.; Allen General Supplies have the contract for a radial brick stack.

Waterloo, Ont.
Hamilton Steel Bridge Works, Bay St., Hamilton, have the steel contract for the addition being made to the High School.

Weston, Ont.
A. B. Ormsby Co. Ltd., 48 Abell St., Toronto, has the contract for rolling steel and metal clad doors for the Industrial School; Hurst & Rogers, 43 Florence St., Toronto, have the contract for cut stone; J. Mercer, 89 Barrington St., Toronto, is doing the plastering and National Fireproofing Co., Toronto, supplying hollow tile.

Woodstock, Ont.
The general contract for the $82,000 addition to the general hospital has been awarded to J. D. Tindall, 567 Adelaide St. Sproatt & Rolph, architects, North St., Toronto.

Business Buildings and Industrial Plants

Fireproof garage planned by Henry Downey & Henry Dewar. Cost will be about $10,000.

Chambord Junction, Que.
$30,000 store and residence planned by F. Fortin. Brick, cement and stucco not yet purchased. Work will proceed in May.

Cornwall, Ont.
Tenders are being received by Mr. Cooperman for two stores and apartments costing over $10,000.

L'Epiphanie, Que.
In June L. H. Desjardins will build a store costing $10,000.

London, Ont.
Pennent & Wilkinson, 86 York St., will make repairs as soon as possible to their garage damaged to the extent of $20,000 by fire.

Montreal, Que.
Tenders will shortly be called for subtrades for the departmental store being built by Archambault & Leclaire Ltd., 71a St. James St., for Dupuis Freres.

Columbus Rubber Co., 1349 Demontigny St., have foundations in for a $35,000 warehouse. Wm. M. Irving 26a Stanley St., is the general contractor.

North Bay, Ont.
A. F. & Percy Doyle, Main St., east will let all trades for the proposed $10,000 extension to their garage

Orillia, Ont.
Orillia Creamery Co. contemplate a $20,000 plant. A. T. Carter, interested.

Penetanguishene, Ont.
The Adams Shoe Co. will shortly commence rebuilding their factory.

St. John, N. B.
Alterations to a store, which will include the installation of an elevator, proposed by C. H. Townsend & Co., King St. F. N. Brodie, 42 Princess St., architect.

Sault Ste. Marie, Ont.
Wm. O'Brien, Grand View Hotel, may build a store block this spring costing $15,000.

Temagami, Ont.
T. & N. O. Railway, North Bay, may build an hotel. Geo. Lee, interested.

Tillsonburg, Ont.
By-law passed authorizing $40,000 accommodation for the Norfolk Shoe Co. Ltd., and tenders for a factory will probably be called shortly. L. C. VanGeel, superintendent.

Toronto, Ont.
John Lucas, 377 Spadina Ave., building a warehouse and office costing $7,000.

F. Galbraith, 8 Fernbank Ave., has excavated for 3 stores and apartments costing $25,000.

B. L. Frechette, 562 Strathmore Blvd., is excavating for a branch for the Canadian Bank of Commerce, 23 King St. west, Dominion Realty Co., 23 King St. west, architects.

Vancouver, B. C.
Dominic Burns will remodel an office building on Granville St., at a cost of $5,000.

Weston, Ont.
Canadian Bank of Commerce plans a branch costing $20,000. Dominion Realty Co., 23 King St. W., Toronto architects. All mechanical trades will be let.

Woodstock, Ont.
Bulk tenders for an addition to a business block are being received by Drs. Melford & Krupp, Dundas & Light Sts., until April 7.

CONTRACTS AWARDED

Hamilton, Ont.
Sparks & McKay, 130 Sherman Ave. East, have the general contract for three stores and apartments for L. Campbell, costing $15,000.

Montreal, Que.
Leggett & Owen, 4128 St. Catherine St. W., have the contracts for plumbing and heating for a building being remodeled by the Montreal Trust Co., 11 Place D'Armes.

St. John, N. B.
Union Foundry & Machine Works, Union St., West St. John, has the contract for steel for the $35,000 factory of Purity Ice Cream Co.

Toronto, Ont.
Canada Bread Co., 160 Avenue Rd., have awarded the general contract for the addition to the factory to Fred Holmes & Sons, Ltd., 123 Bay St.

Reinforced steel for the addition to the Palmolive factory supplied by Burlington Steel Co., 60 King St. W.; casement sash, Architectural Bronze & Iron

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

Tenders Wanted

Tenders will be received by the undersigned until

Monday, April 16th, 1923,

for the erection of a four roomed School Building. in the Town of Milverton, Perth County.

Plans and specifications may be seen at Wm. Smith's Shop, Main Street.

W. J. SPENCER,
Sec-Treas. School Board.
12-14

Tenders for Parapet Wall

Sealed tenders addressed to the Queen Victoria Niagara Falls Park Commission, at Niagara Falls, Ontario, will be received by the undersigned until 12 o'clock, noon, on **Saturday, April 7th, 1923.**

for

(A) Complete construction of a stone parapet wall on concrete foundation with iron panels, total length **715** feet.
(B) Supplying **3200** cubic feet of prepared stone for parapet wall.
(C) Excavate and Construct concrete foundation, place stone and furnish iron panels for parapet walls.

Specifications and plans may be seen and forms of tenders obtained at the Administration Building, Niagara Falls, Ontario. Each tender must be accompanied by a marked cheque for $500.00, payable to the Park Commissioners.

The lowest or any tender not necessarily accepted.

JOHN H. JACKSON,
13-14 Superintendent.

CITY OF LONDON, ONTARIO

Tenders for Supplies

Sealed tenders addressed to "The Chairman and Members, No. 2 Committee" will be received at the office of the City Clerk up to 4 p.m. on **Tuesday, the Tenth Day of April, 1923**, for the following supplies.

Refined Paving Asphalt.
Road Oil.
Portland Cement.
Limestone Dust.
Broken Stone.
Vitrified and Land Tile.
Iron Castings.

Specification and Form of Tender may be obtained at the office of the City Engineer.

Tenders to be accompanied by a marked cheque or a cash deposit as stated in the specification.

Lowest or any tender not necessarily accepted.

G. A. WENIGE,
Mayor.
W. P. NEAR,
14 Engineer.

RATES

30 cents per agate line (14 lines to the inch) Positions Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

Tenders Wanted

Sealed tenders, addressed to the Secretary-Treasurer, for all trades in whole and part for the erection and completion of a

Four Room School Building

for School Section No. 4, Township of North York, Lansing P.O., up to and including **Tuesday, April 10th, 1923.**

No tender necessarily accepted.

Plans, specifications and all information can be procured at the office of the Architects, ELLIS, ELLIS & RICHARDSON, Manning Chambers, Toronto.

B. R. BROWN, Secy-Treas.,
14 Lansing P.O., Ontario.

Tenders for Asphalt

Tenders will be received till noon, April 17th, for the supply of Paving Asphalt and Fuel Oil for 1923.

Quote F.O.B. our siding, in Tank cars. Further particulars at this office.

T. S. SCOTT, City Manager,
14 Niagara Falls, Ontario.

COUNTY OF LINCOLN

COUNTY ROADS

Sealed tender, marked "Tender for Macadam Road" and addressed to Camby Wismer, County Clerk, St. Catharines, will be received until 6 o'clock P.M. on **Monday, April 16th, 1923**, for the construction of approximately three miles of Macadam Road.

A marked cheque for $2,000.00 must accompany each tender.

Plans, specifications and forms of tender may be obtained from the Engineer.

No tender necessarily accepted.

F. N. RUTHERFORD, County Engineer,
14-15 St. Catharines, Ont.

TENDERS

Separate and bulk tenders for all trades will be received until noon, **Tuesday, April 10th**, for

New School Building

at Lakeview, Ontario, Stop 32, Hamilton Highway. A 2½% bid Bond will be required, and a 30% Bond will be necessary upon signing Contract.

Plans and specifications may be had by applying to Mr. Harry Long, Stop 35, Hamilton Highway, or from Chas. M. Hare, Architect, Room 22, 70 Victoria St., and depositing $10.00, which will be returned upon return of said Plans and Specifications. 14

Tenders Wanted

BOARD OF EDUCATION

Sealed tenders addressed to the Business Administrator and Secretary-Treasurer, Board of Education, Administration Building, 155 College St., endorsed with the word "Tender" and also with the name of the school building and trade or article to which it relates. will be received until

Tuesday, April 10th, 1923,

for

(1) Ornamental Iron, Painting and Glazing, Plumbing, Heating and Ventilating. Heat Regulation, Time and Program Clocks, Marble and Tile for HUMBERSIDE COLLEGIATE.
(2) Plumbing for VICTORIA ST. SCHOOL.
(3) Hydraulic Ash Hoist, Plumbing, Masonry for HOWARD PARK SCHOOL
(4) General Trades, Plumbing, for BOLTON AVE., SCHOOL.

Specifications and conditions of tendering may be seen and all information obtained at the office of the Architect of the Board, 155 College St., Telephone Trinity 8200.

Tenders must be in the office of the Secretarial Department at the Administration Building, 155 College St., **not later than 4 p.m. on the day named,** after which no tender will be received.

The lowest or any tender will not necessarily be accepted.

W. W. PEARSE,
Business Administrator and Secretary-Treasurer.
F. E. POWELL,
Chairman Property Committee.
14

STEEL PILING

Bought and Sold

Universal Equipment Company
Niagara Falls. 11-T-f.

TENDERS

The date for the receiving of tenders for all trades required in the erection of an addition to Silverthorn Public School, S.S. No. 35, has been

extended to April 10th, 1923.

JAMES KNOX, Secretary,
189 Rosethorn Avenue.
14

TENDERS

Tenders in bulk, for all trades (except Mechanical trades) will be received until 5 P.M. on Tuesday **April 10th**, for the erection and completion of

St. Martin's Church, Ennismore,

in the Diocese of Peterborough.

Plans and specifications may be seen at the office of the Architect, and also at St. Peter's Rectory, Peterborough.

The lowest or any tender not necessarily accepted.

ARTHUR W. HOLMES, Architect,
79 St. Joseph Street,
Toronto. 14

For Sale

Two Dump Wagons of 2 yards capacity. Mackenzie, Milne & Co. Ltd., Sarnia, Ont. 13-14

For Sale

A 12 cubic foot capacity Wettlaufer Paver Mixer in good running order, cheap. Paul Bergmann, 128 King St., Waterloo, Ont. 13-14

For Sale

In a good, live Western Ontario town, a Builders' Supply business, including an up-to-date plant for manufacturing cement block, field tile, sewer crock, fence posts, ornamental vases, etc.

A first class business in a first class locality, satisfactory reasons for selling. Apply Box 182, Contract Record, Toronto. 14-15

For Sale

1—½-yard Hayward Clamshell Bucket.
1—3 drum, 7 x 12 Robertson Hoist complete with boiler.
1—Dake Steam Swinger.
1—5 ton stiff leg Derrick, 70 ft. steel Boom (used three months.)
1—5 ton Kelly Springfield Tandem Steam Roller (just overhauled.)
Box 199, Contract Record, Toronto. 14-15

FOR SALE

Keystone Excavating Machine, complete with two sticks, skimmer scoop, and three ditching scoops; this machine has been used only one season and is guaranteed to be in first class condition. Price $4,500 f.o.b. St. John, N. B.

Austin Backfiller with caterpillar traction, 4-cylinder Buffalo engine, in equally good condition. Price $2,500 f.o.b. St. John, N. B. Canada Lock Joint Pipe Limited, 65 Pleasant Boulevard, Toronto, Ont.; or St. John, N. B. 6-T.f.

FOR SALE

2 ten ton truck scales or will exchange for 1 twenty ton scale. Wright & Co., 250 Catherine St., Ottawa, Ont. 14

FOR SALE

Keystone Excavator, in good condition. A bargain. Box 202, Contract Record, Toronto. 14

TO RENT

Stone Yard with diamond saws, planer and travelling crane, on railway siding, centre of Ottawa. Wright & Co., 250 Catherine St., Ottawa, Ont. 14

STONE CRUSHER WANTED

I am in the market for a small, second-hand Stone Crusher about 5 x 8" mouth or thereabouts. Please state price, make and style to John Hyndman, Gorrie, Ontario. 14

FOR SALE

Electric Travelling Cranes and Steel Crane Runways

STEEL CRANE RUNWAY—382 ft. long; height of columns 30 ft.; weight about 150 tons. Used for 15-ton Crane 80 ft. span.
1—CLEVELAND ELECTRIC TRAVELLING CRANE 80 ft. span; capacity 15 tons. At present in service on the above Runway.
STEEL CRANE RUNWAY—220 ft. long; height of columns 23 ft Also 22 additional Girders each 20 ft., without columns, sufficient to extend Runway 220 feet additional. Total weight about 50 tons. Used for 7½-ton Crane 70 ft. span.
2—CLEVELAND ELECTRIC TRAVELLING CRANES—37 ft. span; one-15-ton capacity, and one 10-ton capacity, without Electrical Equipment.

Ask for prices and further particulars, also a complete list of our second hand machinery.

The Maritime Bridge Co., Ltd.
NEW GLASGOW, N.S. 14

FOR SALE

Construction Plant

The Commission offers for sale the following Construction Equipment. Sealed tenders, addressed to the Chairman, endorsed "Tender for Construction Equipment," will be received at the offices of the Commission, Public Utilities Building, until noon of April 16th.

Tenders to be based on acceptance of plant as and where located.

1—Thew Revolving Shovel, 1¼-cubic-yard dipper; traction wheels.
1—Thew Revolving Shovel, ¾-cubic-yard dipper; traction wheels.
1—Marion Revolving Shovel, 1¼-cubic yard Dipper Traction Wheels.
13—Two-way Dump Cars; 3-foot gauge; 4 cubic yards capacity.
1—20-ton capacity McMyler Interstate Locomotive Crane; railroad trucks.

Each tender must be accompanied by a cheque for 5% of the offer, payable to the Toronto Transportation Commission, and accepted by a Canadian chartered bank.

The highest or any tender not necessarily accepted.

H. H. COUZENS, General Manager,
Toronto Transportation Commission.
14

GRADUATE MECHANICAL and electrical engineer. Fourteen years design and construction various industrial plants and equipment. Four years city engineer Canadian city. Two years engineer and manager Public Utilities same city, desires active and financial interest in growing manufacturing or general contracting company. Box 195, Contract Record, Toronto. 13

FOR SALE

Contractor's Plant

Stored in Eastern Ontario on Railroad Siding

One Doty 6 x 9 Hosting Engine Double Cylinder, double friction drums, Swinger and Boiler.

1/3 yd., Smith Mixer with 5 x 5 Vertical Steam Engine.

One Vertical Boiler 36 x 100 W.P. 125 lbs.

One Locomotive Boiler 50 H.P.

One No. 4 Model Keystone Excavator with scoop and skimmer.

Apply Box 192, Contract Record, Toronto. 13-14

A Service to the Profession

Every man wishing to tender must first see the plans and specifications.

If the plans are in Montreal and he is in Vancouver the inspection is a problem. We, however, with your assistance, are able to solve it. Place them on file at any or all of the offices of the "Contract Record" throughout the Dominion.

Contractors, engineers and allied manufacturers read the "Contract Record." It is the logical publicity medium for the announcement of tenders wanted.

Send us your plans. They will receive the best of care.

A room is reserved in each of our offices for examination of your plans by possible bidders.

Contract Record and Engineering Review

Toronto	345 Adelaide St., W.
Montreal	119 Board of Trade Bldg.
Winnipeg	302 Travellers' Bdg.
Vancouver	106 Winch Bldg.

Road-Making Foreman Wanted

Foreman wanted in Quebec town about ninety miles from Montreal. Must be able to take entire charge of building asphalt-bound macadam road. A good salary will be paid to competent man. In replying to advertisement, give full particulars of experience. Box 194, Contract Record, Toronto. 13-14

GENERAL CONSTRUCTION SUPERINTENDENT with 25 years experience handling all classes of Buildings. Practical also Registered Professional Civil Engineer, wants position. A1 references. Will go anywhere. Box 175, Contract Record, Toronto. 11-14

CONSTRUCTION SUPERINTENDENT with 15 years experience handling all classes of building and water work, wants position. A1 testimonial and guarantee results. Will go anywhere. Box 147, Contract Record, Toronto. 12-14

Considering Electrification

The prevailing shortage of coal and the advantages in the utilization of water power have caused a revival of the extensive electrification plans in Germany. Semiofficial figures give a total of 434.5 kilometers (270 miles) in operation and 816 kilometers (508 miles) under construction or proposed on May 1, 1922.

[illegible] Lansdowne Ave., [illegible] slate metal, F. [illegible] & Son, [illegible] Lippincott St.

[illegible] Lowe Co., [illegible] Bldg., have the general contract for [illegible] plant for Canada [illegible] Co., costing $[illegible]

Windsor, Ont.

The contract for structural steel for the factory for Wischell-Scheill Co., Detroit has been awarded to Canadian Bridge Co., Walkerville.

John V. Gray Construction Co., Barlet Bldg., have the general contract for a factory for Witchell-Scheill Co., 168 Brooklyn St., Detroit.

Residences

Brantford, Ont.

Dr. J. A. Phillip, 356 Colborne St., is receiving tenders on a $22,000 dwelling. H. R. Watson, Excelsior Life Bldg., Toronto, architect.

Dundas, Ont.

F. C. Haskins & Co., have the general contract for a residence for Harry Lawson, Main St., at a cost of $10,000.

Fredericton, N. B.

Albert E. Kilburn, 347 George St., will build a dwelling costing $5,000. Contracts for sub-trades to be let.

Hamilton, Ont.

Work has just started on a $22,000 residence for Mrs. E. M. Moore, c/o L. B. Young, general contractor, 776 King St. E.

Kitchener, Ont.

Ten residences costing $50,000 planned by O. N. Schiefele, 90 Cameron St. No material purchased.

Listowel, Ont.

Dwelling costing about $5,000 planned Fred Howe.

Moncton, Ont.

G. V. Steeves, Park St., will make an extension to apartments at a cost of between $[illegible]0,000 and $25,000.

Dr. A. J. Gaudet, College Bridge, proposes to build a residence costing $8,500.

Montreal, Que.

A. Leclair, 120 Leclair St., will build a residence and garage costing $14,000

Two residences costing $14,000 proposed by L. J. Gravel, 823 St. Dennis St.

Plans ready and tenders will be called shortly for a nine suite apartment house by A. Potvin, 26 St. James St., architect.

Point Grey, B. C.

Smellie & Gallagher, 458-14th Ave. W., are excavating for an $8,000 residence for J. L. Kerr, 1056-13th Ave. W., Vancouver.

Preston, Ont.

J. H. Mickler, associate architect, is receiving tenders until April 7 for a residence costing $30,000.

St. Lambert, Que.

Five residences costing $40,000 will be built by the Provident Freehold & Realty Co., 42 Sacrement St., Montreal.

Toronto, Ont.

Plans for a $17,000 Duplex residence for W. G. Noble, 538 Sherbourne St., are being prepared by Bredin Galbraith, Excelsior Life Bldg. Architects will supervise work and let small trades.

Tenders for a residence and garage costing $25,000 will be received by T. W. Chadburn, 37 Mountview Ave., until April 14.

Dwellings costing $30,000 will shortly be commenced by G. W. Ormerod, 55 Westlake Ave. W. G. Hunt, Confederation Life Building, architect.

Plans are being prepared by Neil G. Beggs, 6 Jean St., for six duplex houses.

One pair of residences costing $13,000 will be built by Grimshaw Bros. 2032 Yonge St.

A. B. McLelland, 1504 King St. west, is excavating for a $12,000 residence.

E. Hulme, 256 Kennedy Ave., is excavating for a $7,500 residence. Subtrades to be let.

H. B. Taber, 213 Raglan Ave., is receiving tenders for plastering, wiring and painting a residence costing $12,000.

Plans will be revised and E. G. Wilson, 42 Langley Ave., will call new tenders on a $15,000 residence.

Tenders will be called shortly for a $20,000 residence for J. R. Staunton, c/o H. R. Watson, architect, Excelsior Life Bldg.

H. Stedman, 190 Northcliffe Blvd., has excavated for six bungalows.

Residence and garage costing $7,500 are being built by G. M. Davis, 303 Symington Ave.

Tenders on all trades for a $[illegible] residence are being received by E. G. Wilson, 42 Langley Ave.

Waterloo, Ont.

Plans are being prepared for a $[illegible] bungalow for E. E.Ratz, 246 King St., by A. E. Scheifele, 90 Cameron St. Tenders called on April 1 will close April [illegible]

$[illegible],000 residence contemplated for J. Hall, 89 Albert St., who is having plans prepared by A. E. Scheifele, 90 Cameron St. Tenders will be called in April.

Windsor, Ont.

[illegible] Windsor Ave., [illegible] residence costing $[illegible]

Winnipeg, Man.

C. W. U. Chivers, 23 Aikin's Building, is preparing plans for repairs to a residence which will cost about $8,000.

CONTRACTS AWARDED

Montreal, Que.

Geo. Daoust, 180 St. James St., has the general contract for a $12,000 apartment house for T. Gauthier, 1129 St. Hubert St.

The general contract for an apartment house costing $80,000 awarded by G. B. Lafond, 565 University St., to J. Gody, 2730 Drolet St. Sub-trades to be let.

St. Lambert, Que.

Oscar Tremblay, St. Lambert, is building two bungalows for Mrs. L. Sincennes, Montreal, costing $10,000 each. S. Frappier, 2238 Park Ave., Montreal, architect.

Toronto, Ont.

Jack & Awde, Armadale Ave., are building a $9,000 dwelling for F. W. Sieveright, 240 Sherbourne St.

H. B. Hamm, 51 Northcliffe Ave., has the masonry contract for two detached residences costing $13,000. J. Hunt Stanford, architect, Yonge St Arcade.

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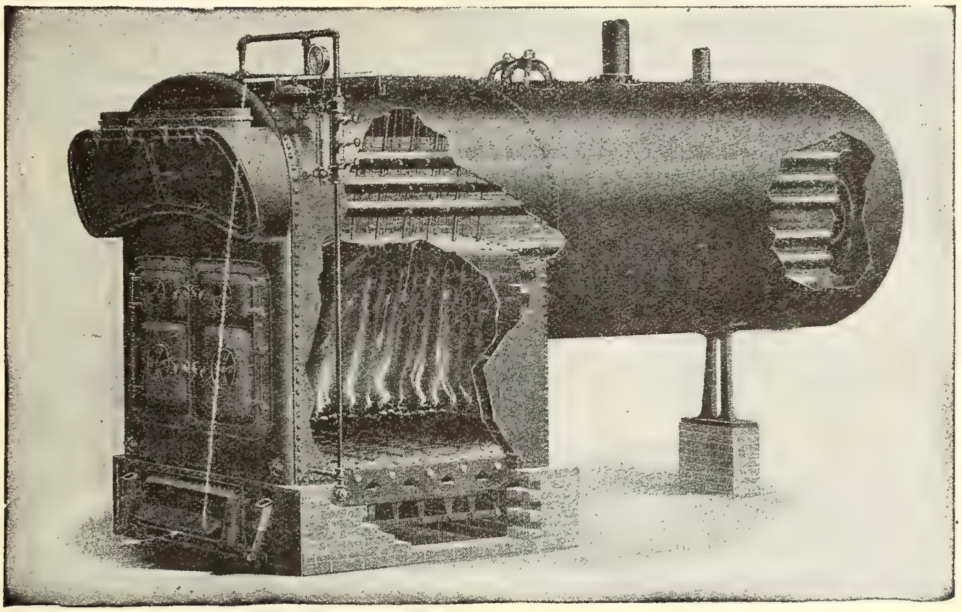

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Val-Morin, Que.

Laurentian Power Company, St. Jerone St., Quebec, are installing an electric lighting system costing $20,000. This work will probably be completed about May 15.

Miscellaneous

Montreal, Que.

A. Mercure, architect, formerly of 103 St. Francois Xavier St., has moved to 713 Mount Royal Ave. east, at the corner of Chamboard St.

Prince Albert, Sask.

The contract for the supply of a three quarter cubic yard capacity mixer with electric motor, to be used in the Saskatchewan Penitentiary at Prince Albert, awarded to London Concrete Machinery Co., Ltd.

Province of Quebec.

Recent incorporations in the Province of Quebec include: C. B. Grose Housing Company, capital $10,000, head office at Montreal; Corporation des Lodgements Ouvriers, Ltee., capital $500,000, head office, Montreal.

Prince Edward Island.

Tenders for cement, steel reinforcing, sand, gravel, etc., for the Provincial Department of Public Works will be received until April 27. L. B. McMillan, Charlottetown, secretary.

Toronto, Ont.

Rogers Supply Co. Ltd., 28 King St. W., will occupy offices in the General Accident Building, Bay & Temperance Sts., about April 1.

Yarmouth, N. S.

Purchase of a centrifugal pump contemplated by the Town Council. Mr. Wickwire, engineer.

CONTRACTS AWARDED

Brantford, Ont.

City Council has awarded the contract for the year's supply of road oil and asphalt to United States Asphalt Refining Co., New York.

Chatham, Ont.

Contracts for cement to Canada Cement Co., Toronto, 5,400 bbls. and Alfred Rogers Ltd., Toronto, both at $3.20 per bbl.; bonder stone, Hagersville Crushed stone Co.; sewer pipe, J. H. Oldershaw & Son, 122 St. Thomas St., Chatham.

St. Johns, Que.

The C. P. Rly., Montreal, has let the general contract for a steel water tank to Canadian Des Moines Steel Co., Inshes Ave., Chatham.

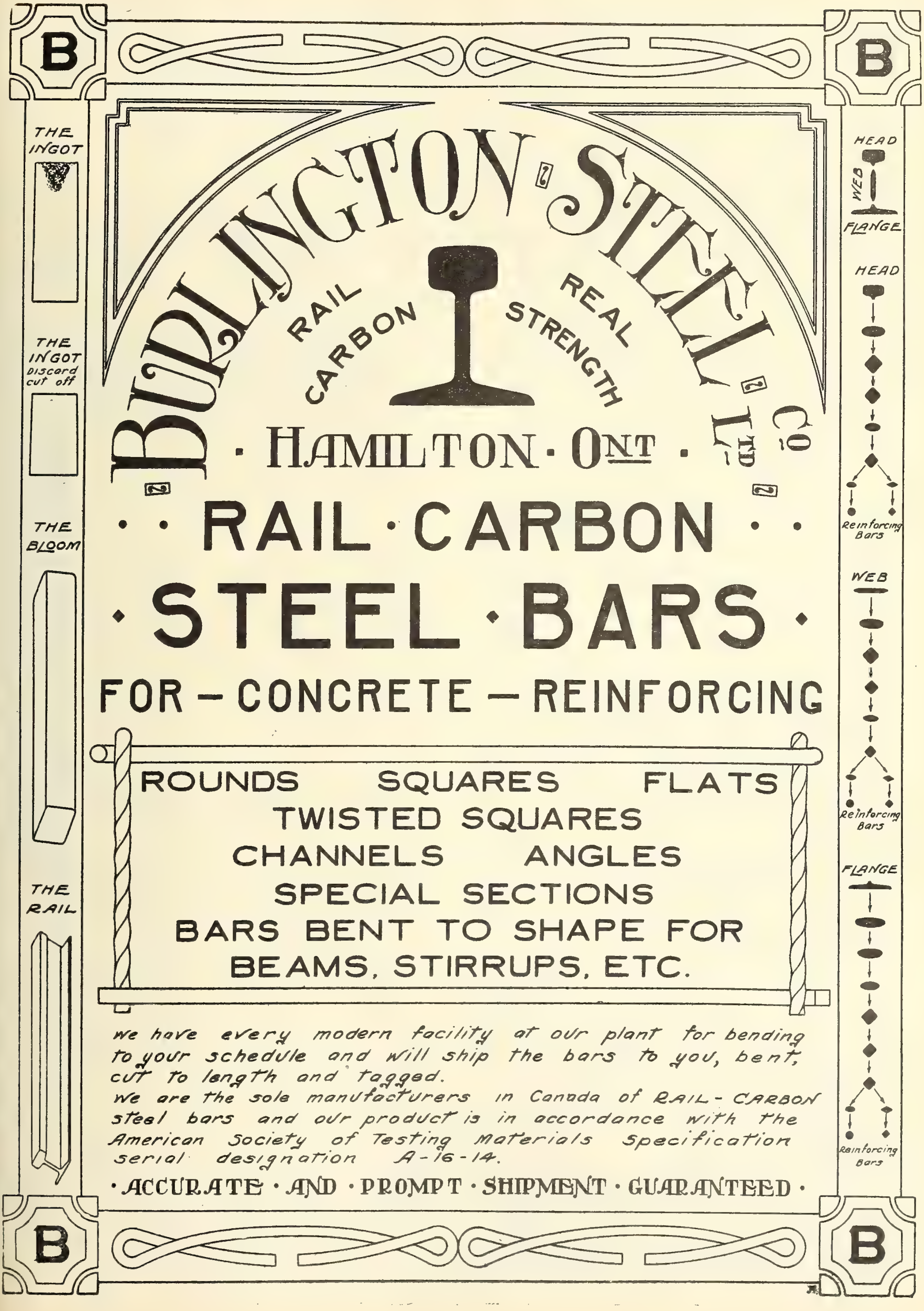
Fires

Brantford, Ont.

Loss on building was $100,000 when fire destroyed the factory of Brandon Shoe Co., 17 Dufferin St. A. Brandon, owner.

Hamilton, Ont.

$25,000 loss sustained when building owned by Hamilton Uniform Cap Co., 214 King William St., was damaged by fire.



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Current Prices of Building and Engineering Materials

CEMENT (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Retail lots including bags	per bbl.	$4.60	$4.16	$4.80	$3.70
Car lots, including bags	per bbl.	3.60	3.48	4.20	3.35
Refund on bags	each	.20	.20	.20	

LIME (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Lump, in retail lots	per ton	14.30	14.00	.58 bu.	2.70 bbl
Lump, in car lots	per ton	12.70**	11.00	13.80 ton*	2.60 bbl
Hydrated, in retail lots	per ton	20.00	26.00	.63 bag*	30.00
Hydrated, in car lots	per ton	19.00	21.00	.56 bag*	25.00

BRICK and TILE (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Common face brick	per M.	24.00	16.50*	19.00	30.00
No. 1 dry pressed brick	per M.	31.00	30.00	36.00	70.00
No. 2 dry pressed brick	per M.	29.00	25.00	32.00	
Enamelled brick	per M.	125 up to	230.00	185.00	150.00
Wire cut brick, for foundation work	per M.	21.00	19.00		50.00
Sand lime brick	per M	17.00		18.00	
Hollow building tile	per M.			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	60-95	60-75	85-100	80.00
Fire clay	per ton	13-20	15-16.00	35.00**	22.00

STONE, SAND and GRAVEL (f.o.b. cars on siding):—		Toronto	Montreal	Winnipeg	Vancouver
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.00 yd.
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 "	" "
Crusher run	per ton	2.20½		3.00 "	" "
Rubble stone	per ton	2.45	1.70	15.00 cord	" "
Gravel, 2 in. screened	per ton	2.05		2.45 yd.	" "
Gravel 1 in. screened	per ton	2.31	1.50	2.75 "	" "
Sand, screened	per ton	1.42½	1.25	1.90 "	" "
Pit run	per ton	1.52¾	1.25	1.90 "	" "

STEEL and IRON (f.o.b. warehouse):—		Toronto	Montreal	Winnipeg	Vancouver
Mild steel bars, ¼ in. and heavier	per 100 lbs.	3.75 base	3.50 base	4.60	4.00
Bands 3/16 in. and lighter	per 100 lbs.	4.25 "	3.50 "	5.10 base	
Hoops	per 100 lbs.	5.00 "	4.50 "		
Twisted and deformed bars	per 100 lbs.	3.75 "	3.50 "	4.55	4.00
Angles, channels and tees under 3 in.	per 100 lbs.	3.90 "	3.75 "	5.35	6.00
Structural shapes	per 100 lbs.	4.00 "	3.75 "	5.05 base	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.40 "	3.75 "	5.15	6.25
Plates—3/16 in.	per 100 lbs.	3.60 "	4.10 "	5.55	6.50
Plates—10 gauge	per 100 lbs.	4.40 "	4.50 "	5.45	6.50
Black sheets—28 gauge	per 100 lbs.	5.50 "	5.00 "	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.90	7.00	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	6.65 "	7.00 "	7.70	8.25-8.50
Rivets	per 100 lbs.	6.25 "	6.00 "	7.00 base	
Cast iron pipe	per ton	65.00	60.00		

VITRIFIED CLAY PRODUCTS (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Sewer pipe, 4 in.	per ft.	.40	.30	.35	.28
Sewer pipe, 6 in	per ft.	.60	.45	.45	.48
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.55
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.70
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.85
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00	.90	.65	.75
Chimney tops	each	9.00	3.50–5.00	7.50	4.50–6.00
Discounts		45 % truck lots 50 % car lots	20 % 50 %	5 %	

CEMENT:—*Discount of 10 cts. per bbl. in 20 days. Price f.o.b. cars is $3.75 †Subject to 5% discount. **Excluding bags.
LIME:—*Discount of 5%. †Bag of 50 lbs. **Price f.o.b. cars is $11.70.
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STONE SAND AND GRAVEL:—*Winnipeg prices subject to 5% disco **Toronto prices include sales tax.

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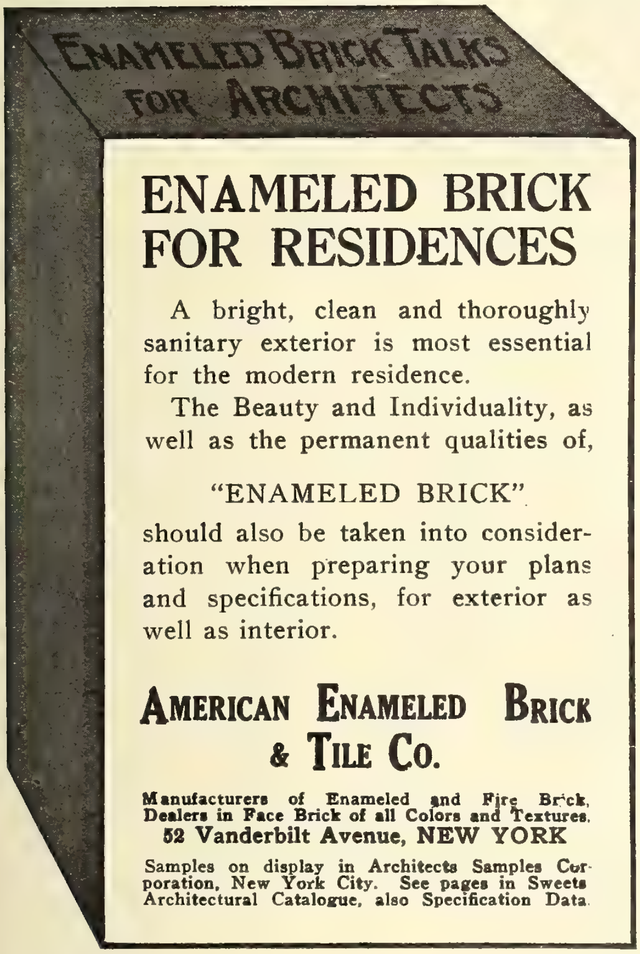
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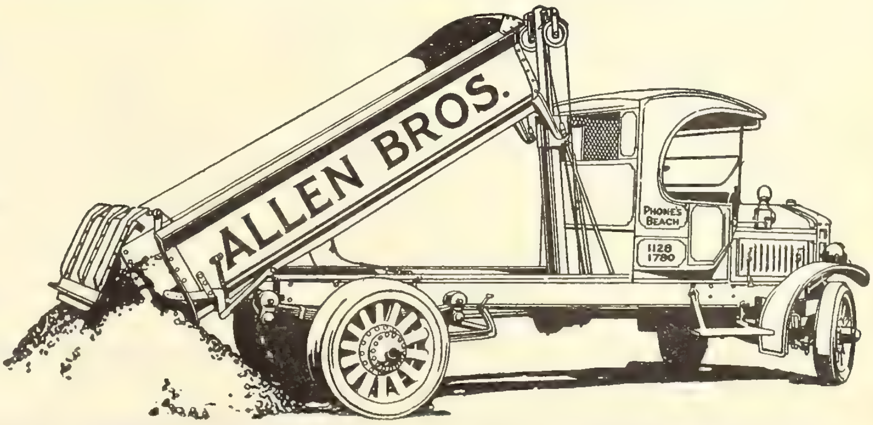

CURRENT PRICES OF BUILDING AND ENGINEERING MATERIALS—continued

Lumber (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver*
Flooring, 1 x 3 and 4 in., clear, E. G. fir	per M.	90,00	60.00	94.50	55.00
Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	70.00	65.00	63.00	30.00
Flooring, No. 1 pine	per M.	70.00	80.00	64.80	
Flooring, No. 1 Spruce	per M.	48.00	45.00	40.50	
Flooring, birch and maple, 13/16 in. clear	per M.	130.00	110.00	171.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	130.00	125.00	157.50	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	70.00	65.00	63.00	30.00
V joint, No. 1 pine	per M.	70.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	43–58	45.00	67.50	
Red and Jack Pine, 2 x 4 to 12 in., com. rough	per M.	44/58	70.00	40.50	
Hemlock, 2 x 4 to 12 in.	per M.	42/45	40.00	42.50	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	40–50.00	50.00	38.70	11.00-13.50
Spruce, 1 and 2 x 4 to 12 in.	per M.	44/58	45-35	38.70	
Timbers, fir, 10 x 10 in. and up	per M.	65.00	58.00	55.00 base	17.-22.00
Lath, No. 1 white pine	per M.	16.00	12.00	12.60	
Lath, M. R. spruce	per M.	10.00	8.50	11.25	7.00
Shingles, XXX B.C. cedar	per M.	6.50	5.00	6.30	3.40
XX B.C. cedar	per M.	4.50	4.25	4.50	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	115.00	55.00
Fir casing	per M.	1 ct. per in.	100.00	115.00	

PAINTS, OILS, COLOURS (delivered):—		Toronto	Montreal	Winnipeg	Vancouver*
White lead ground in oil, less than ton lots	per cwt.	14.55	13.75	15.60	15.80
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	22.00
Putty in bulk	per cwt.	5.95	4.25	5.50	9.25
Steel sash putty in bulk	per cwt.	6.45	6.00	8.00	7.75
Boiled linseed oil, in bbls.	per gal.	1.28	1.18	1.26	1.28
Raw linseed oil, in bbls.	per gal.	1.25	1.15	1.23	1.25
Turpentine, in bbls.	per gal.	2.25	2.00	2.50	1.60
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 9/10	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 4/5	.45

PLASTER (Delivered):—		Toronto	Montreal	Winnipeg	Vancouver*
Hard wall plaster, sanded	per ton	13.50	15.00	25.40	30.00
Plaster of paris, in bbl. lots	per bbl.	6.00	5.35	1.60 bag*	7.50
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu.	1.50

LABOR:—		Toronto	Montreal	Winnipeg	Vancouver*
Bricklayers	per hr.	1.00	.80–.90	1.15	1.06¼
Structural Iron Workers	per hr.	.85	.50–.75	1.25	1.00
Plasterers	per hr.	1.00	.80	1.05	1.06¼
Hoisting Engineers	per hr.	.70–.80	.50	.90–1.10	1.00
Plumbers	per hr.	.90	.60–.75	1.00	.90
Carpenters	per hr.	.80	.65	.90	.81¼
Painters	per hr.	.75	.55–.65	.80	.81¼
Electrical Workers	per hr.	.80	.65	.70– .90	1.00
Roofers	per hr.	.65	.65		.90
Laborers	per hr.	.40–.50	.30	47½–.55	.50–.56¼
Sheet Metal Workers	per hr.	.75			.90

LUMBER:—*Owing to the general unstable condition of the present lumber market, Vancouver dealers refuse to quote any prices at all especially for Prairie or Eastern publication. The prices are, moreover, fluctuating from day to day. Such prices as we quote are, therefore, averages and not standard.

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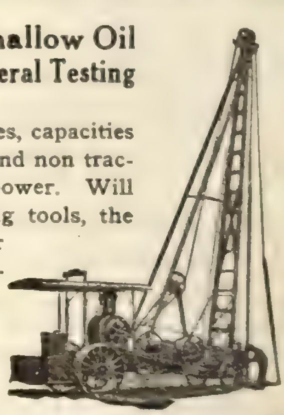

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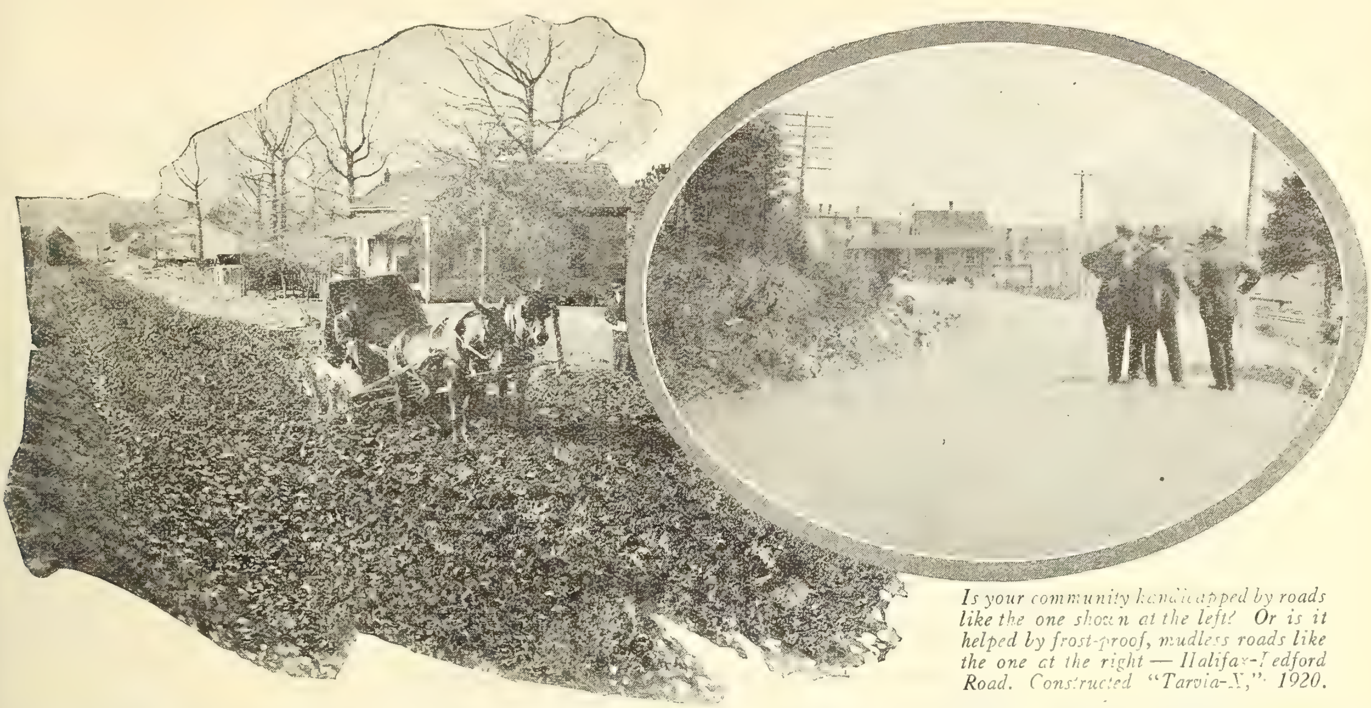

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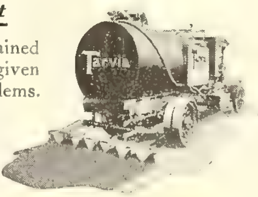

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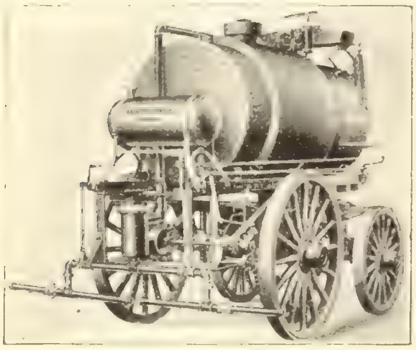

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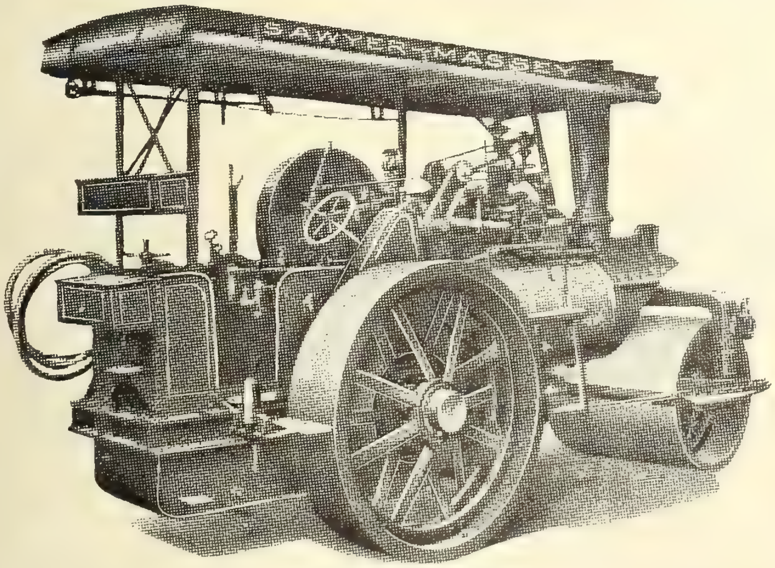

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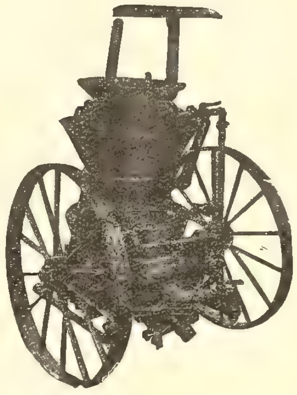

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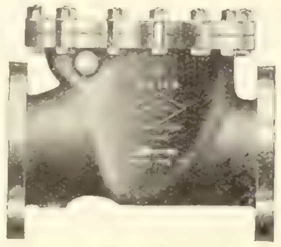

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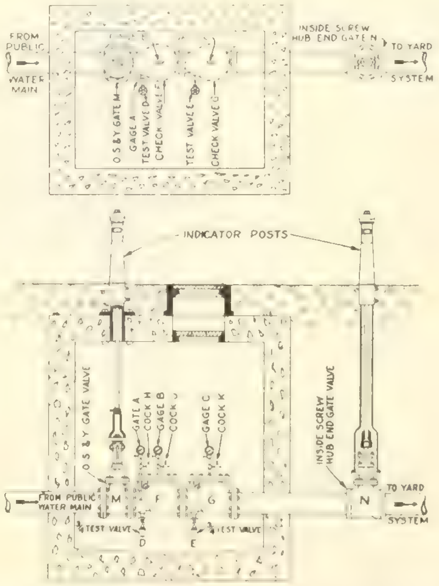

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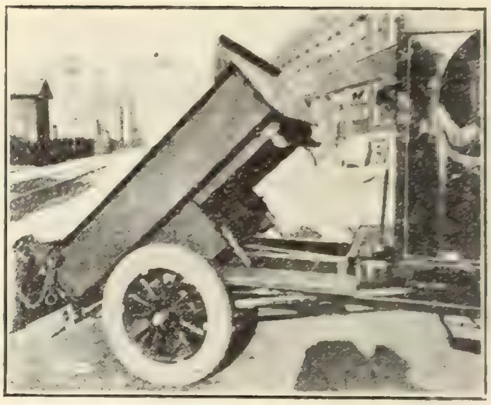

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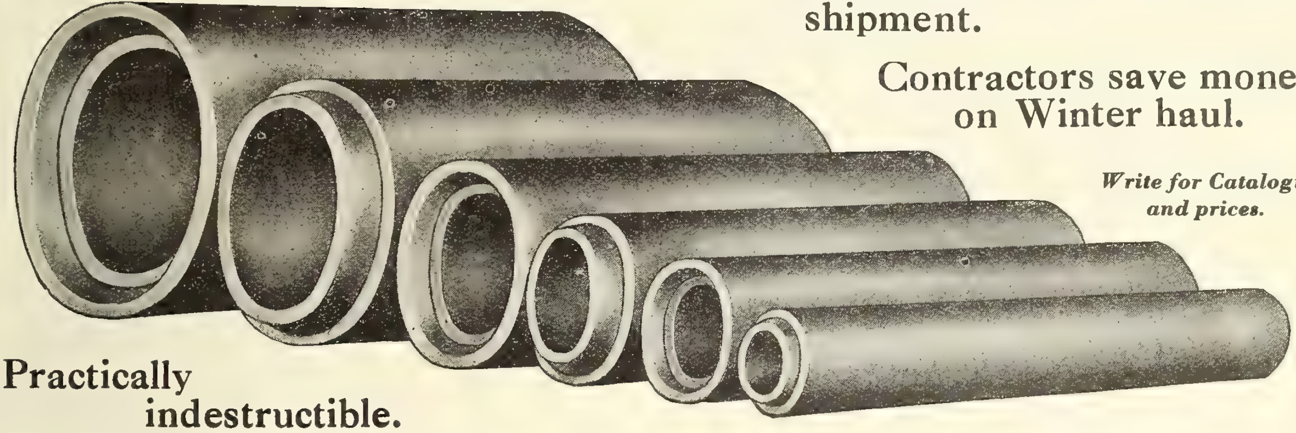

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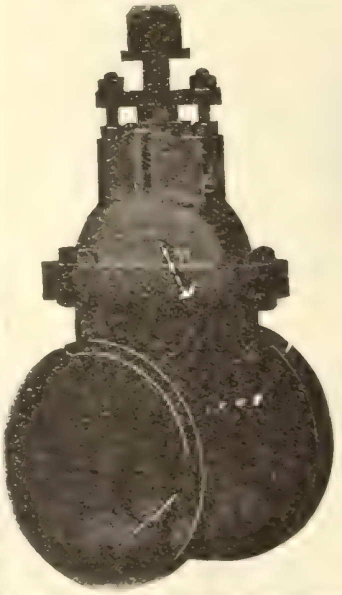

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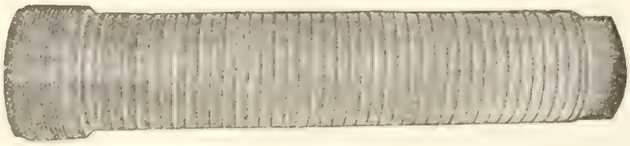

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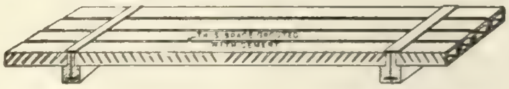

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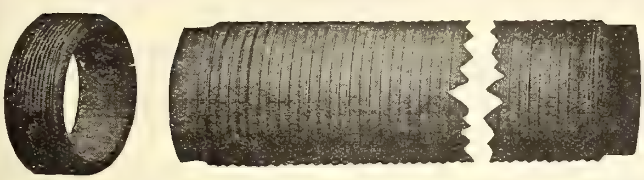

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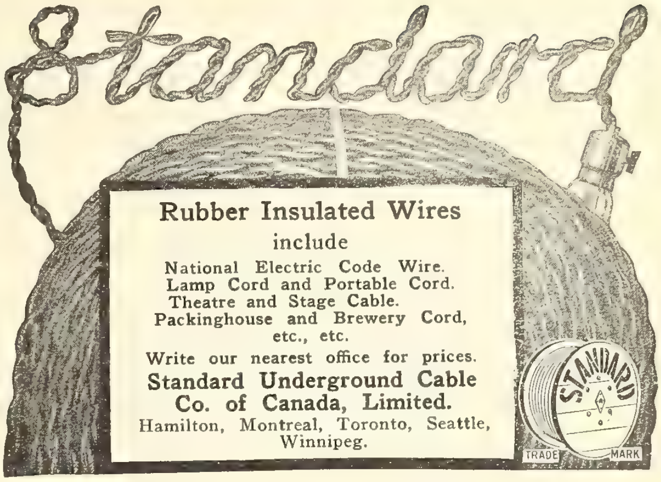

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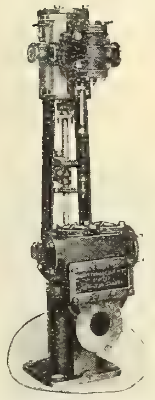

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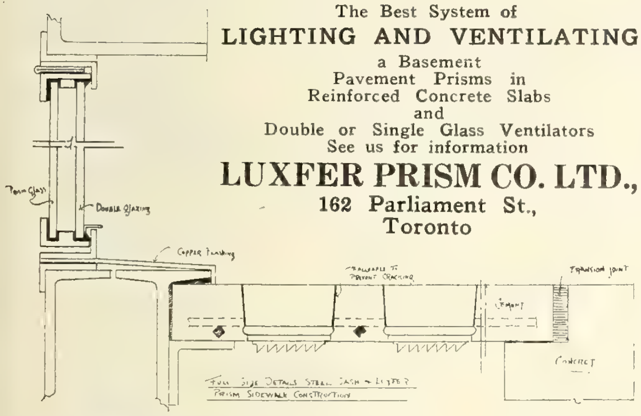
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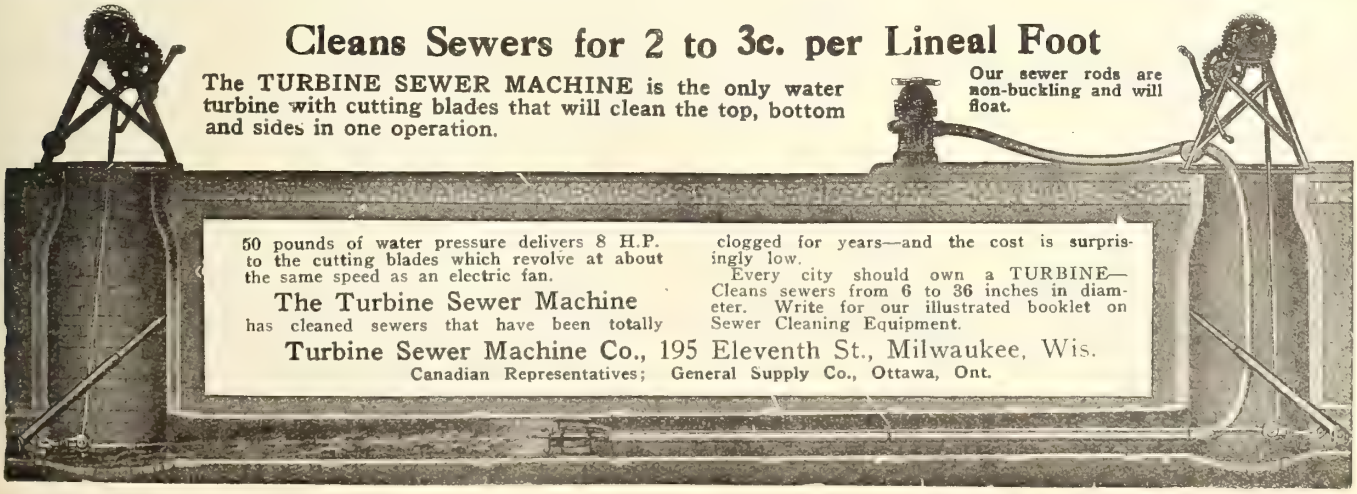

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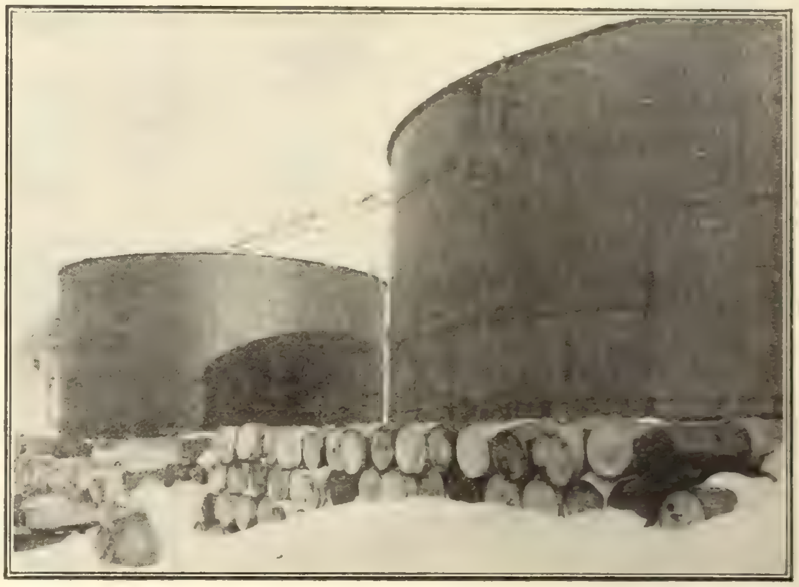

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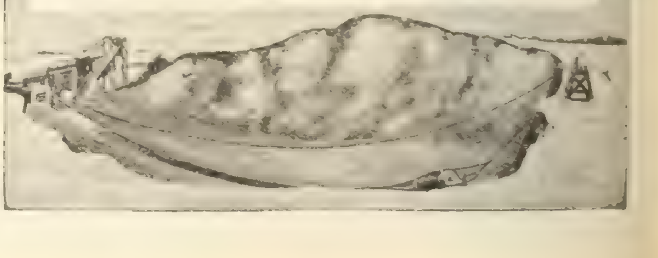

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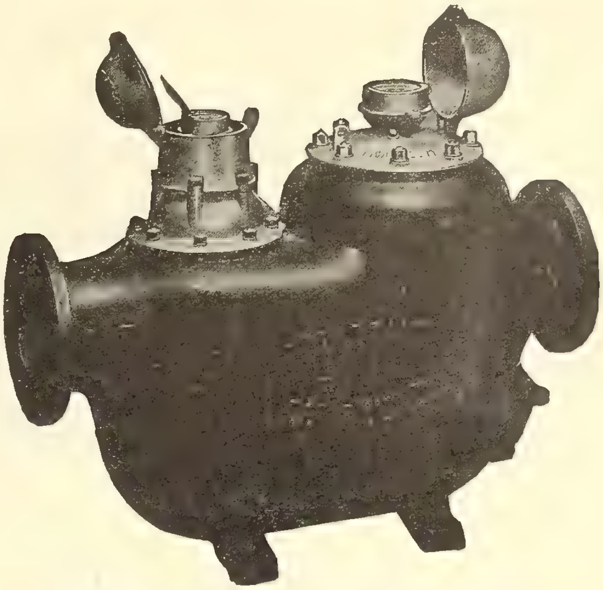

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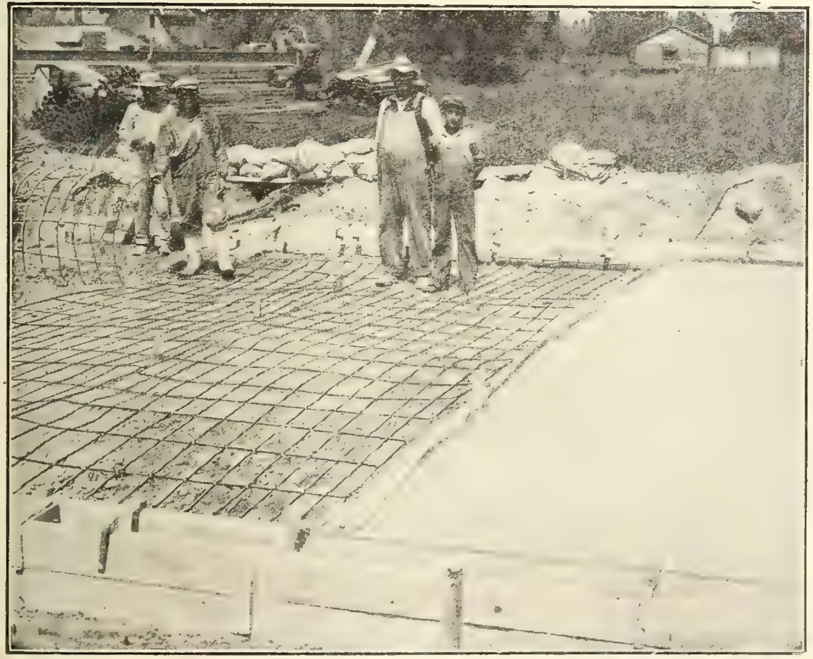

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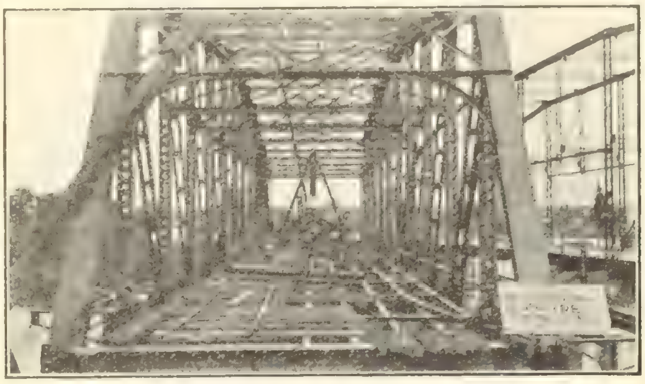

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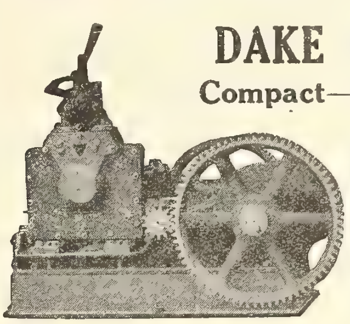

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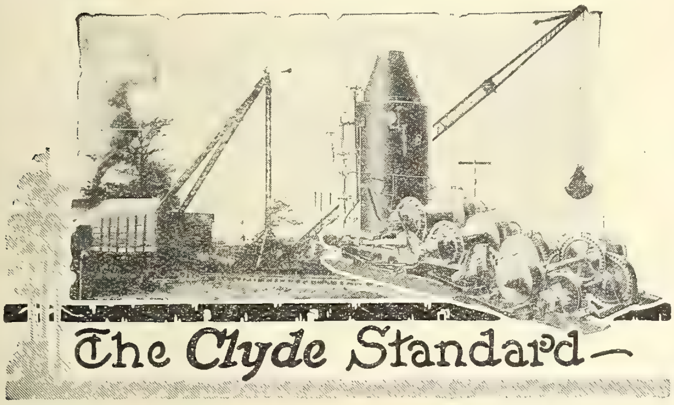
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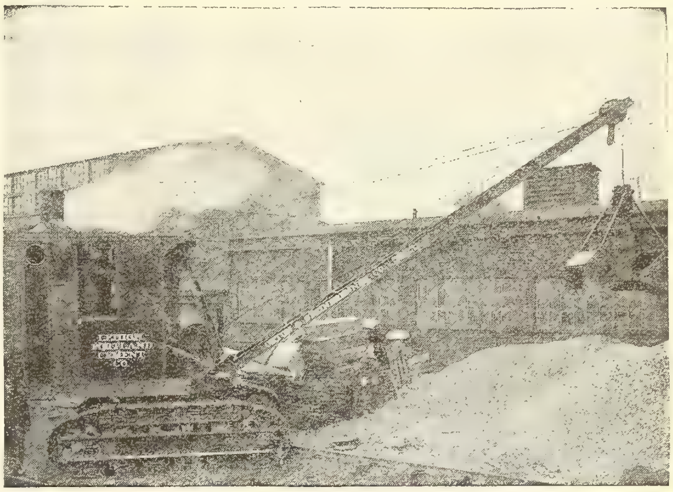

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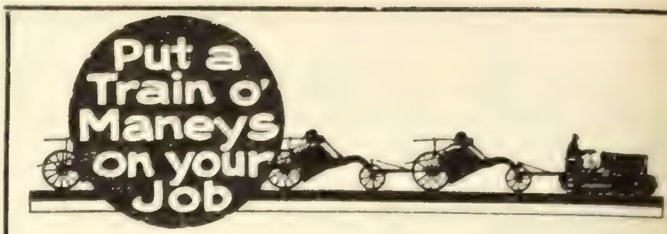
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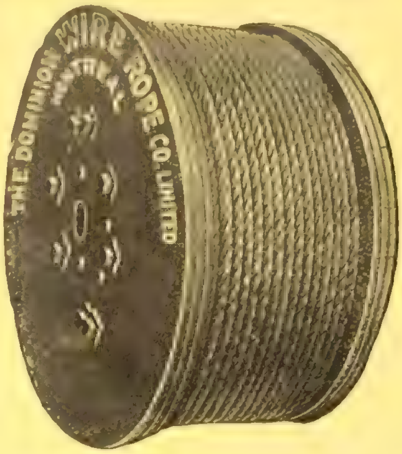
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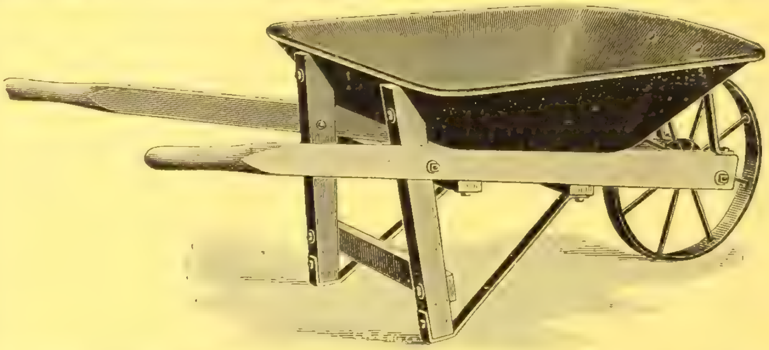

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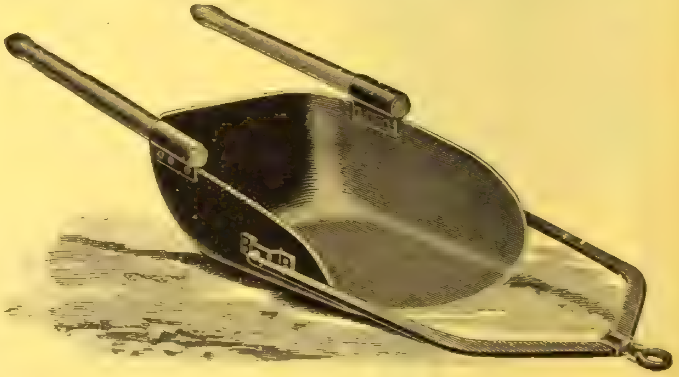

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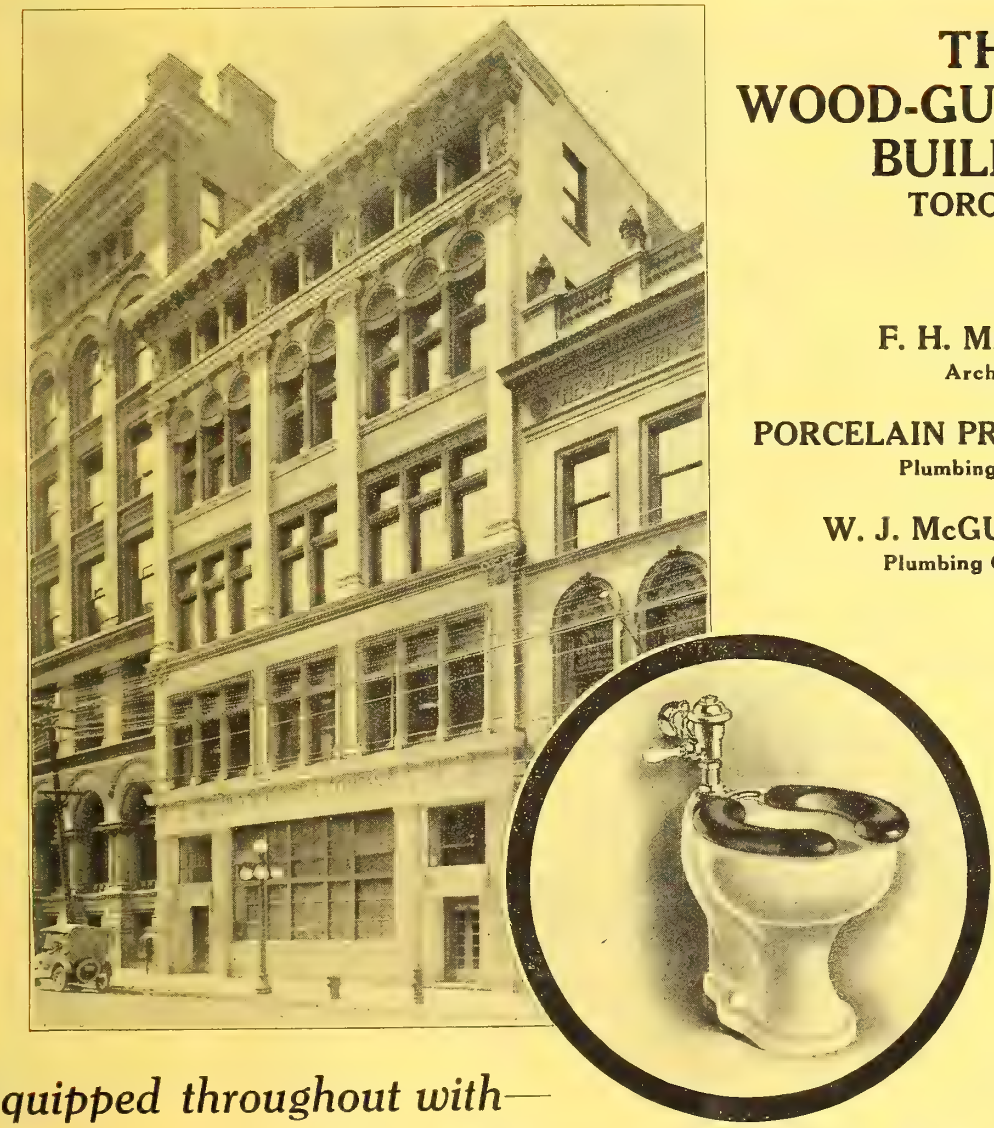

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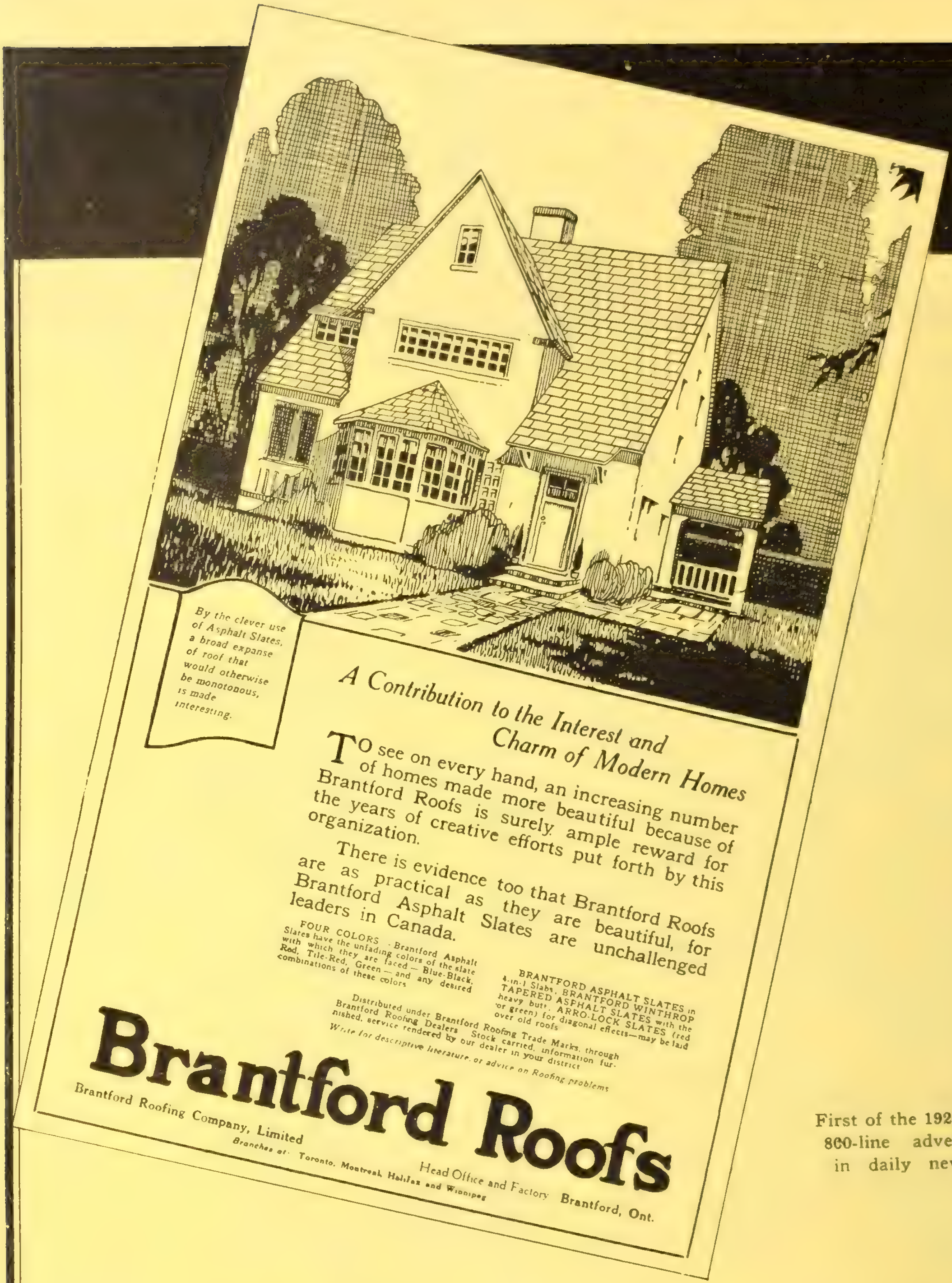

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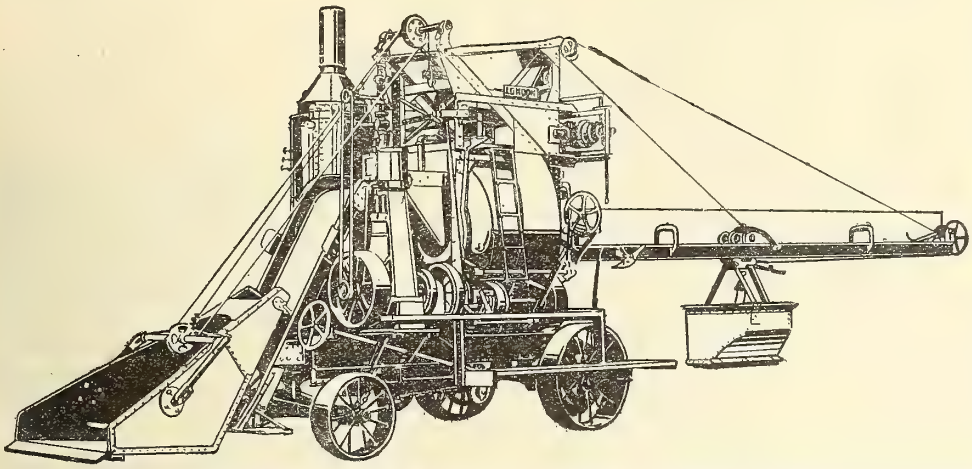

Fig. 16 B. London Paving Mixer. Made in two sizes with Rotary Delivery Chute and also with Boom and Bucket and full Creeper (Caterpillar) Traction. Described in Bulletin 49-K-B.

They are being specified by Engineers who know from experience that the first cost of a machine should not be the deciding factor when purchasing equipment.

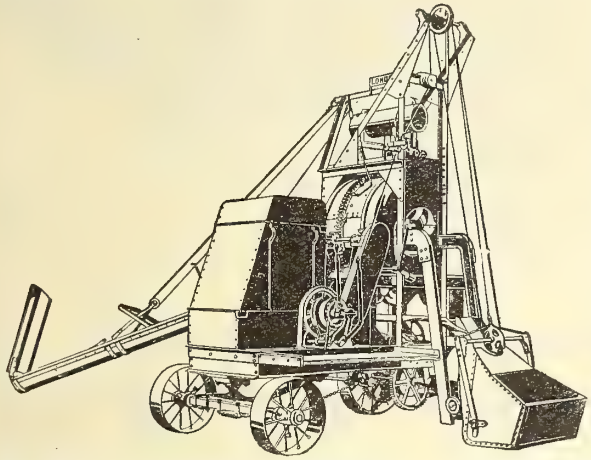

Fig. 801. London Traction Sidewalk Mixer. Travels along the street under its own power and deposits the concrete on the sidewalk while moving. Described in Bulletin 49-L.

We are demonstrating daily that our factory in London, Canada, produces machines that more than meet the competition of the world. Our foreign orders verify this statement. Last month a British engineering firm having a large Government contract in China, after much investigation, purchased TEN LONDON MACHINES ON ONE ORDER for shipment to Hong Kong. London Machines have an enviable reputation both at home and abroad.

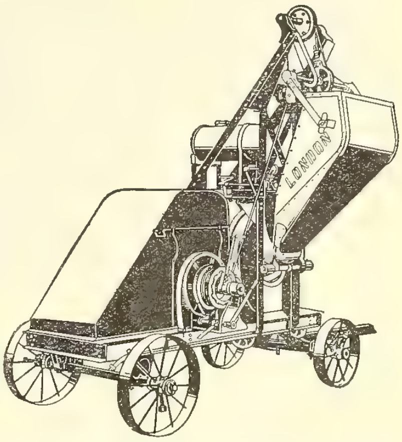

Fig. 33. London Heavy Duty Builders' Mixers. Built in five sizes with steam, gasoline or electric power. Described in Bulletin 49-F-1.

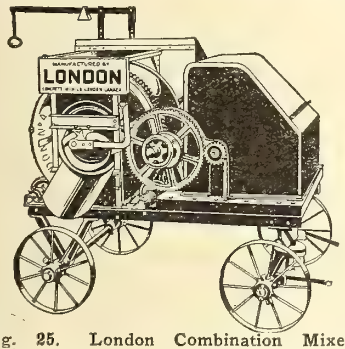

Fig. 25. London Combination Mixers. Built in two sizes. Two Machines in one. A Concrete Mixer and a real Hoisting Drum built into one unit. Described in Bulletin 49-D-1.

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We manufacture Concrete Mixers, Hoists, Air Compressors, Pumps, Brick Block and Tile Machines, Barrows, Carts, Silo Moulds, Ornamental Moulds and Tools.

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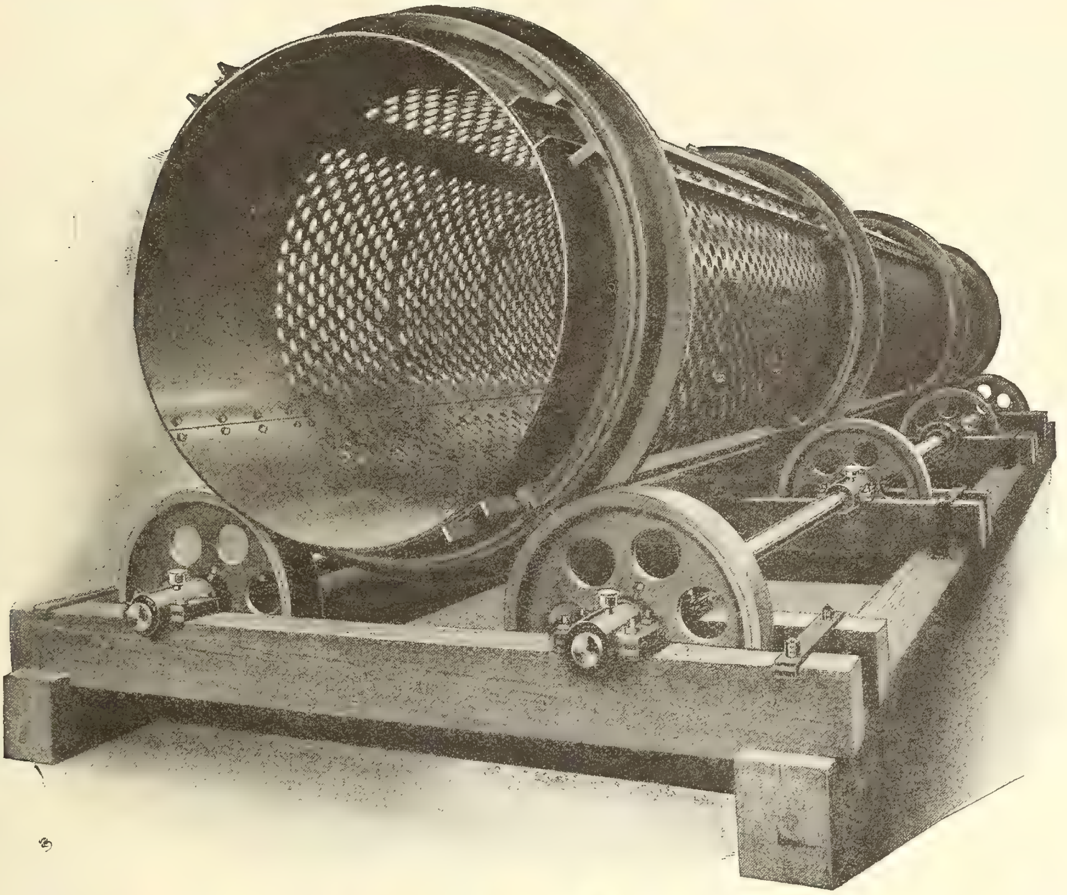

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Otis-Fensom Elevator Co.
Turnbull Elevator Company

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Fuller & Johnson Mfg. Co.
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Le Roy Company
Sterling Engine Co.
Waterous Engine Works Co.

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Canadian Equipment Co.
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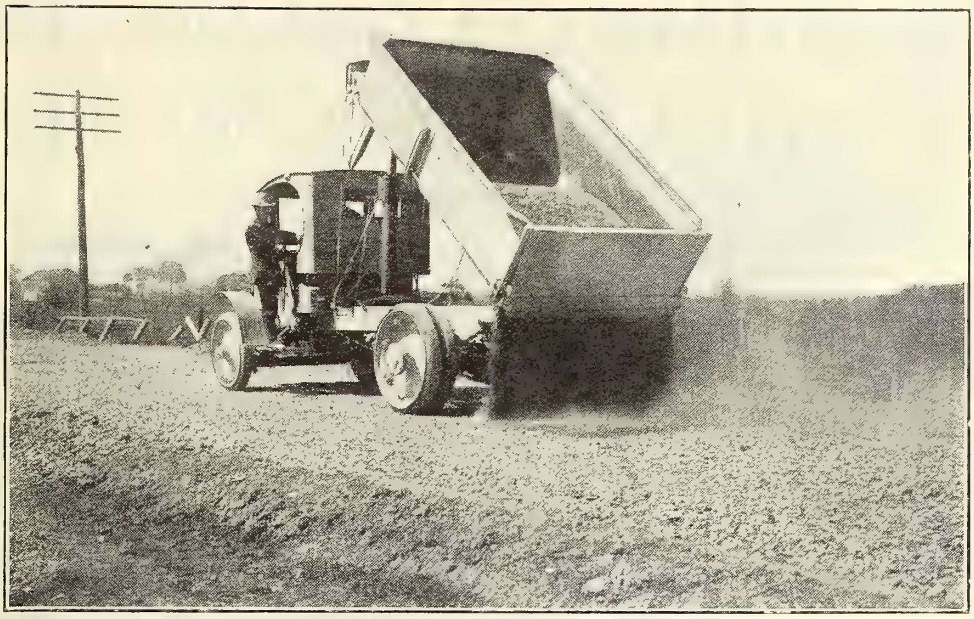

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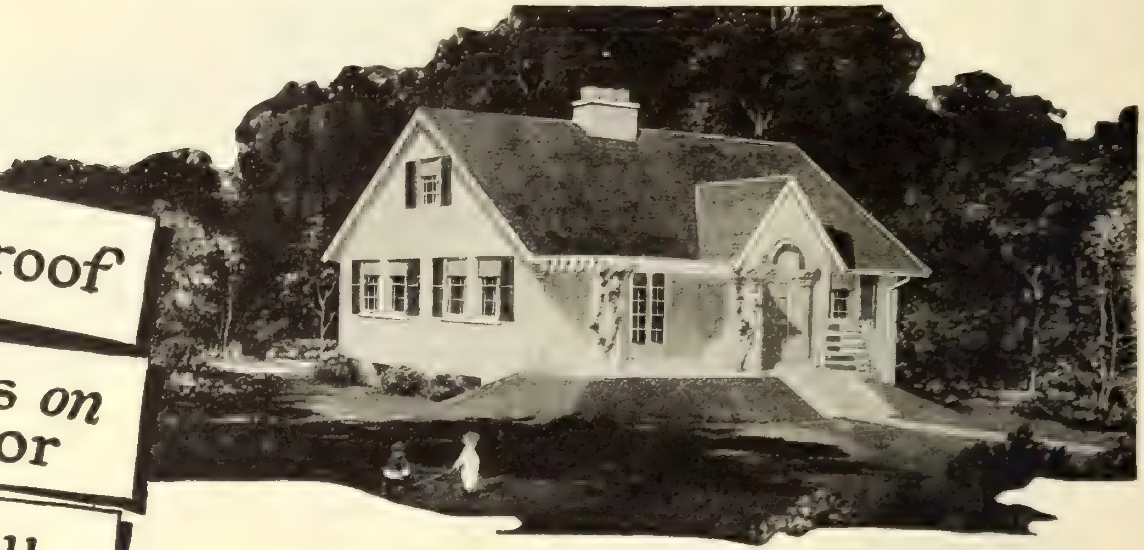

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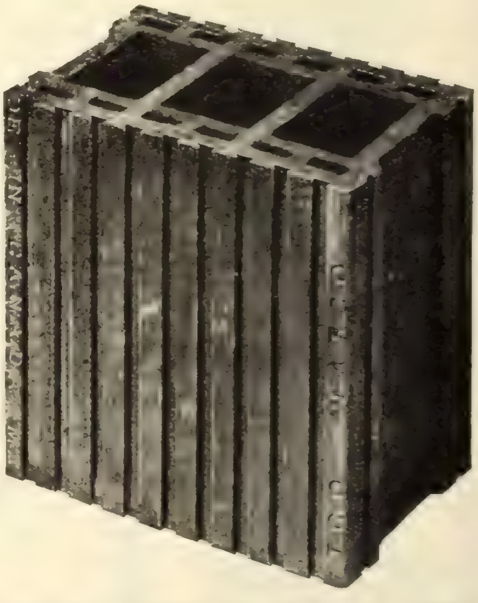

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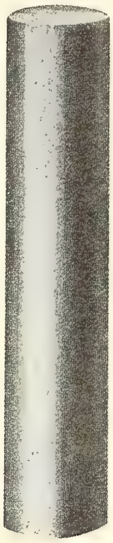

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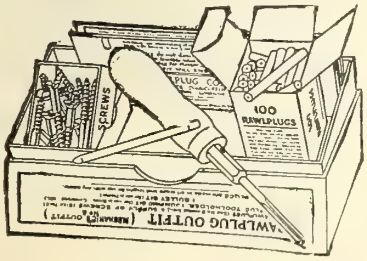

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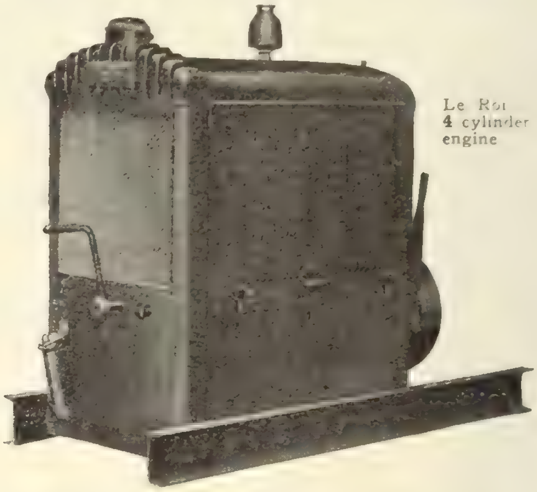

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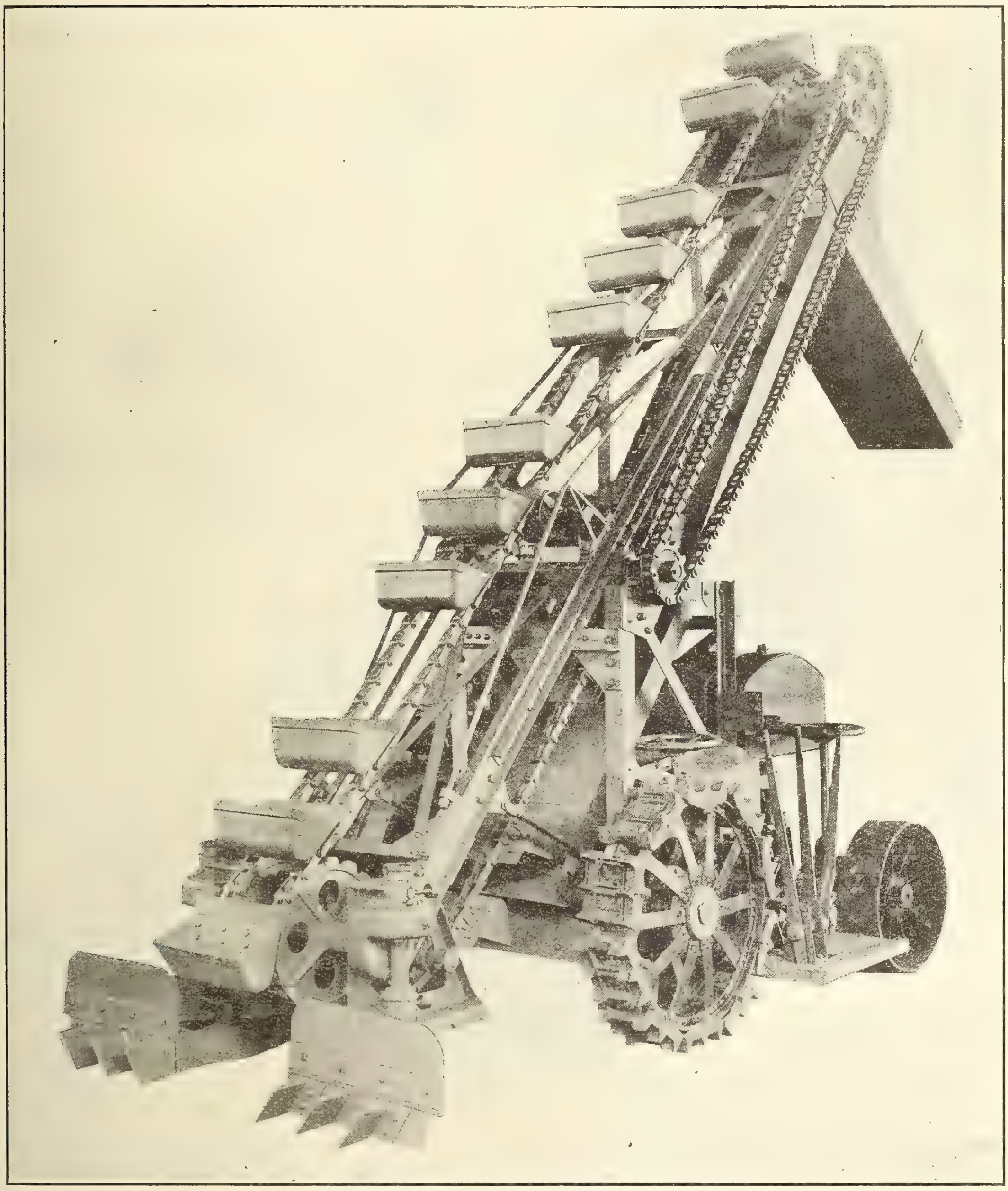

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AUSTIN MACHINERY
"MOVES THE EARTH-
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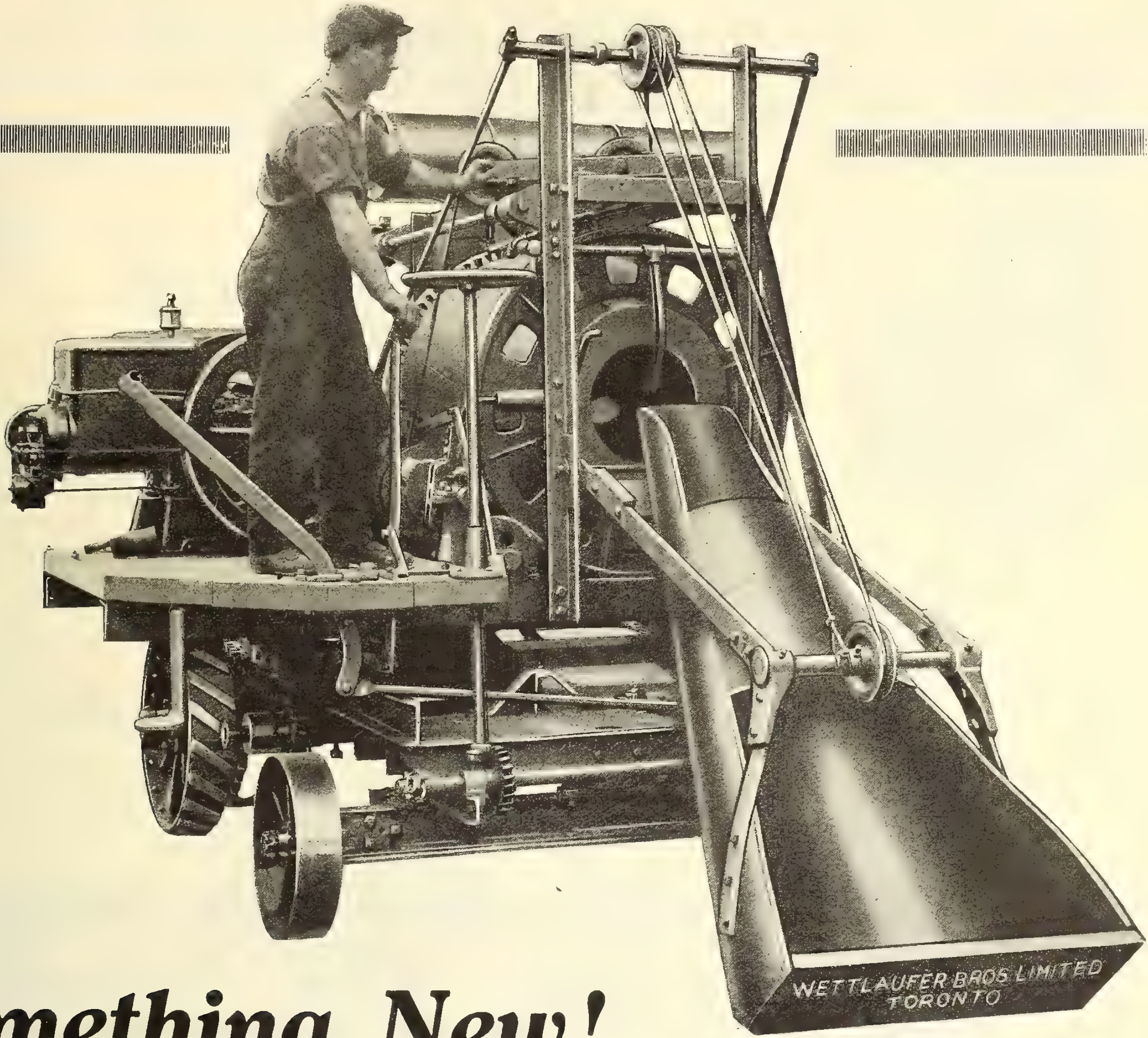

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This is the machine to speed up your production, cut down your labor costs and give you better concrete. It's the biggest advance in the contracting business since the invention of the power mixer.

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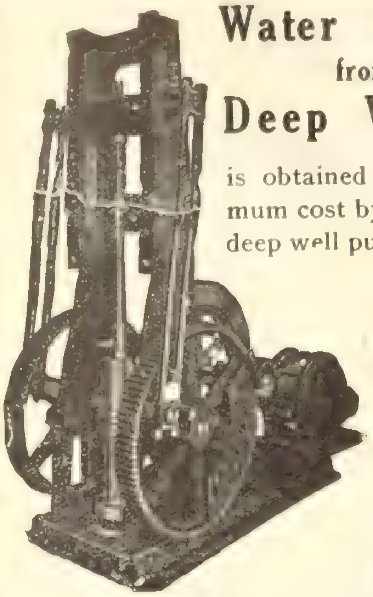

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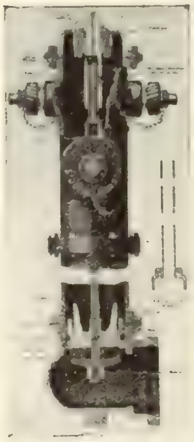

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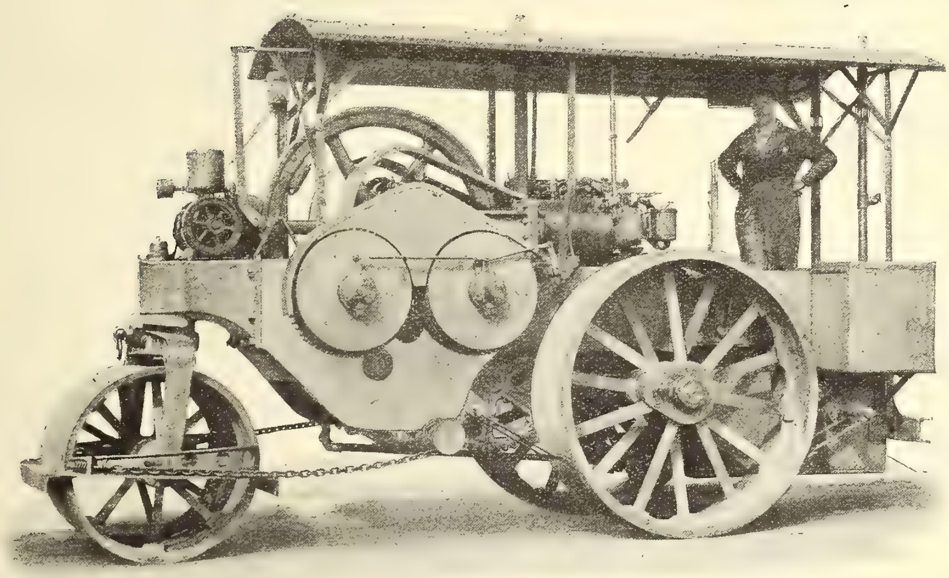

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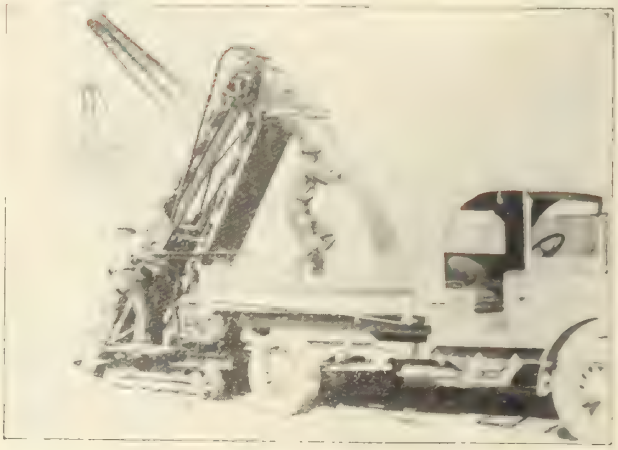

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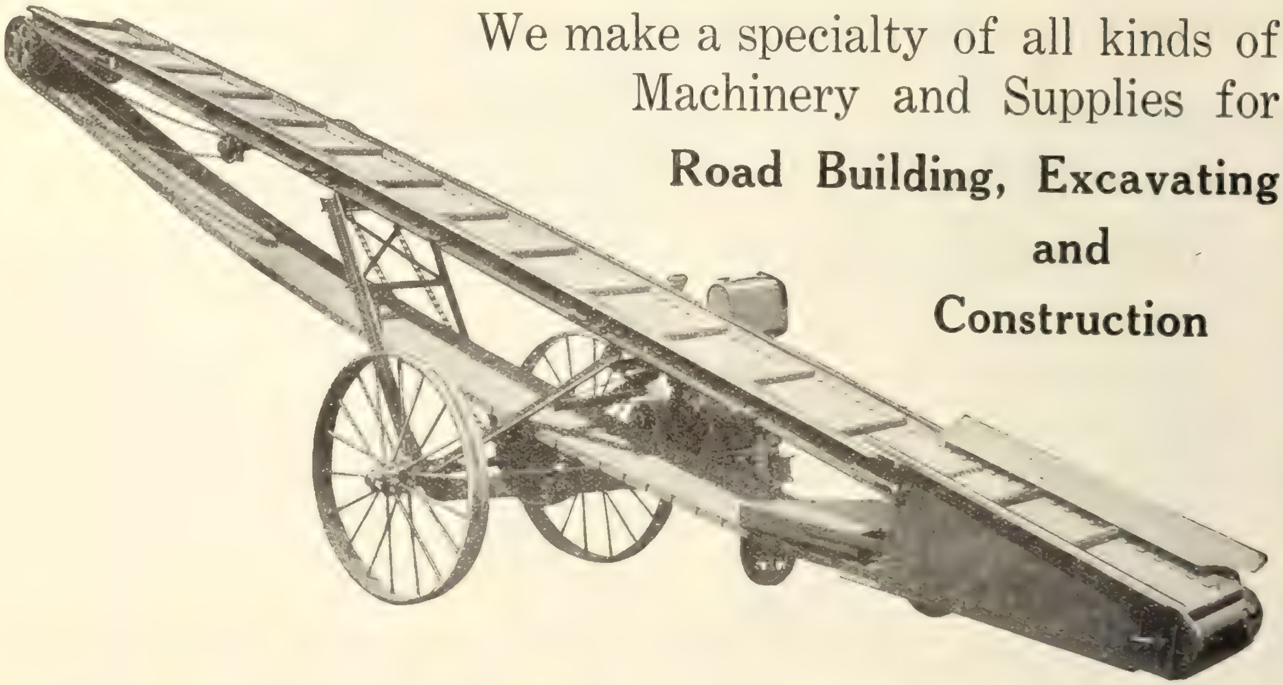

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The Job Goes Well

When you equip it with high-class machinery

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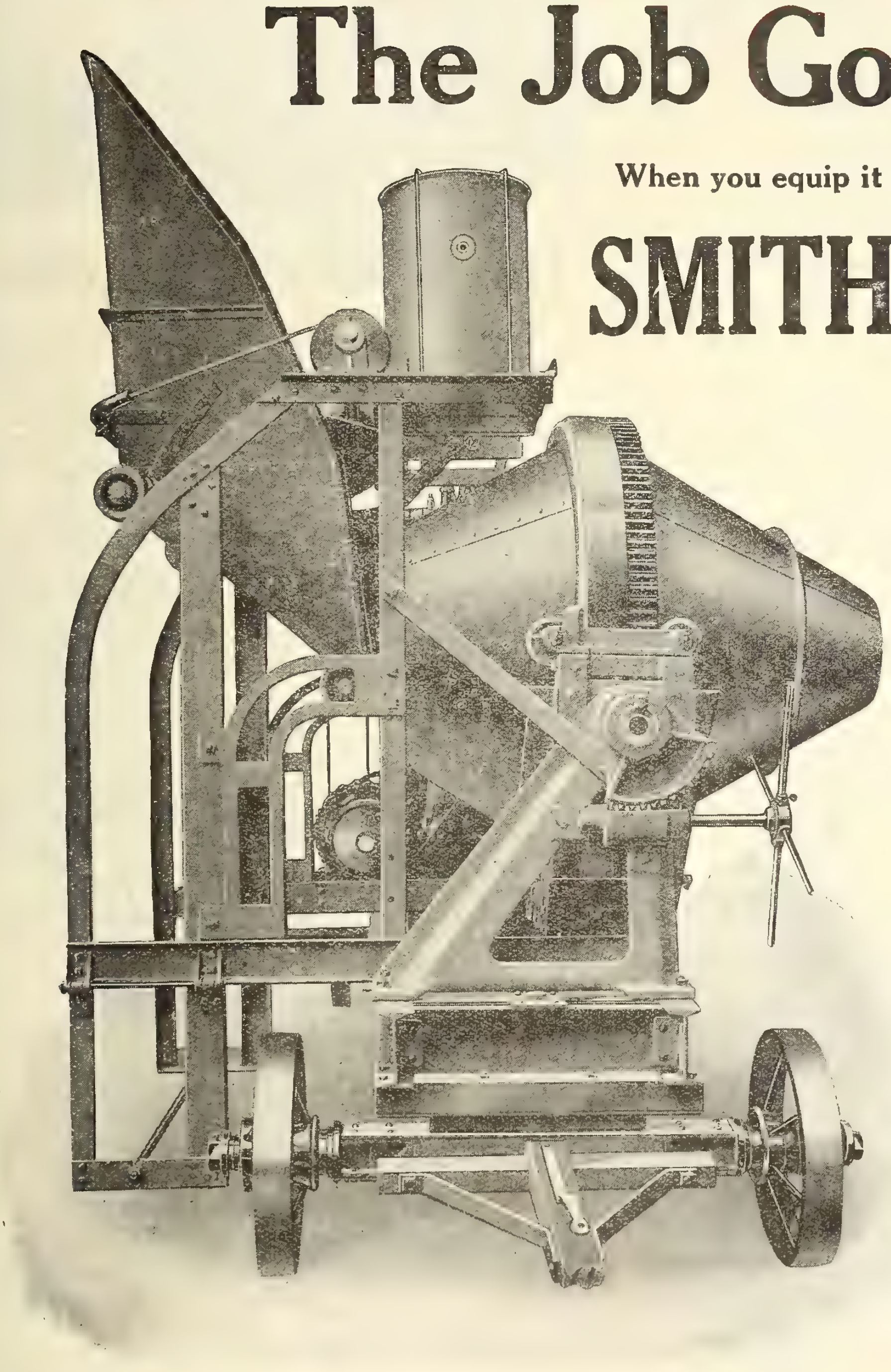

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Complete assortment of Concrete Mixing and Handling Equipment.

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Over any ground—soft, muddy or rough, it "walks"—the excavator without planks, skids, track or trackmen.

Labor cost is cut, more material handled and the whole job speeded up.

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The Pioneer of Progress

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Have You Changed
your fire protection system to conform to Ontario Provincial Board of Health New Regulations?

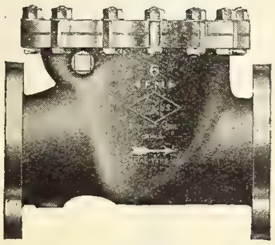
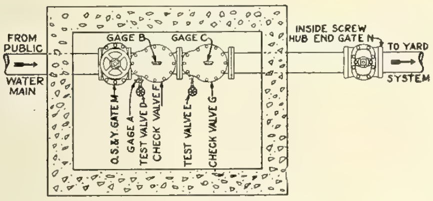
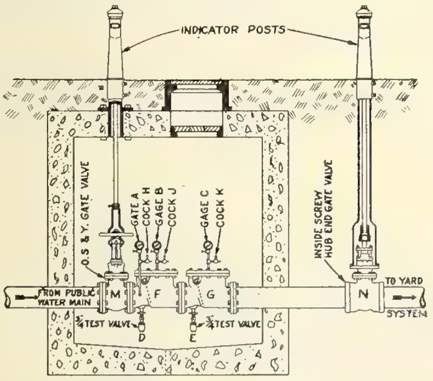


Fig. 481

Here we show you an
Iron Body "Special" Type
Jenkins
F. M. Swing Check Valve

and below a diagram showing correct method of installation.
These valves are approved by the Ontario Provincial Board of Health and are used for connections between a fire protection system having an auxiliary supply that is pumped and a municipal water supply.
Valves are designed to resist corrosion and disarrangement of parts and two of them being connected in series prove most efficient in operation.
Detailed particulars, prices and copy of Catalog No. 9 will be mailed on request.





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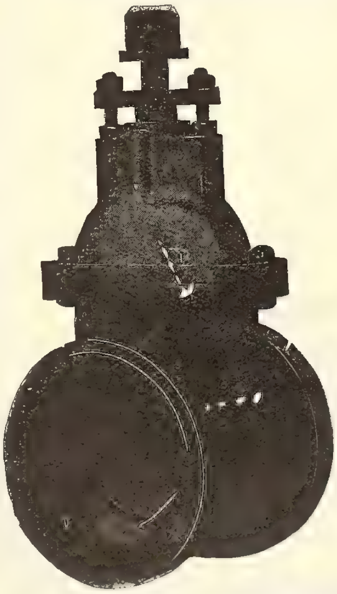

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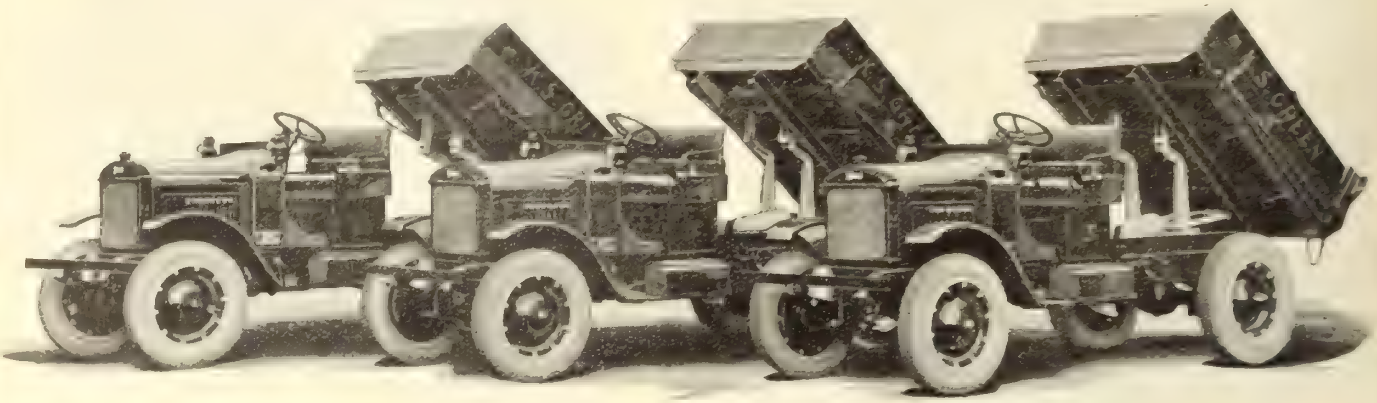

3 of a Fleet of 6 Stewarts in Road Building Work

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This chassis for road builders and contractors has a wheelbase of 120″, with a remarkably short turning radius. Either pneumatic or solid tire equipment.

The body of two yard capacity is comparatively low to the ground, with approximately 40% of the total load carried on the front wheels. The standard rear discharge type of body is fitted with an underbody Hydraulic hoist, having a centre swinging partition control for the driver. The body is 78″ long and 67″ wide, including the flares. Control lever on dial is attached to heel board underneath driver's seat. The pump is supported on special bracket, bolted to both sides. It is impossible for the hoist to crawl on chassis, there being a tie rod anchor to the body hinge.

It is also possible to supply the above chassis in a 3½ to 4-ton capacity, having body of three yard cubic capacity.

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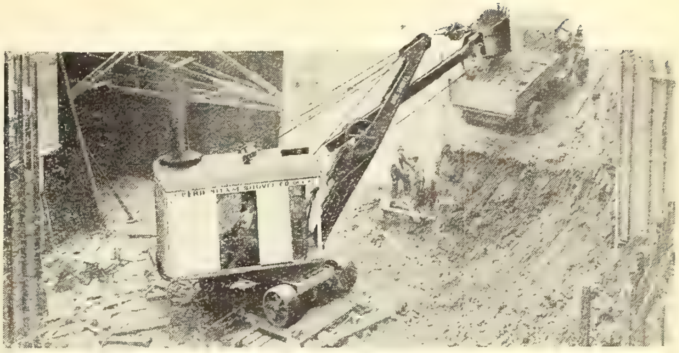

Loading trucks on a 14-ft. bank

with the "best earth mover on the market today"

"The photograph shows our **ERIE** excavating for the recent King Edward Hotel addition in Toronto. 16,000 cu. yds., which the **ERIE** dug in 40 days of 9 hours each. In this 22 ft. excavation, we are able to load trucks on a 14-ft. bank as shown in the photo.

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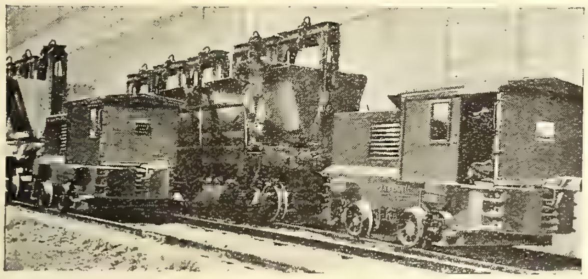

Plymouth Locomotives on Welland Canal

Four Plymouth Gasoline Locomotives are a part of the equipment of Doheny, Quinlan & Robertson, of Thorold, Ont., who have the contract for excavation and cement construction of a section of the Welland Canal—the world's biggest project now in work.

The camera shows two Plymouths, handling large cars and massive buckets filled with wet batches to be hoisted and poured into the great forms of the retaining walls.

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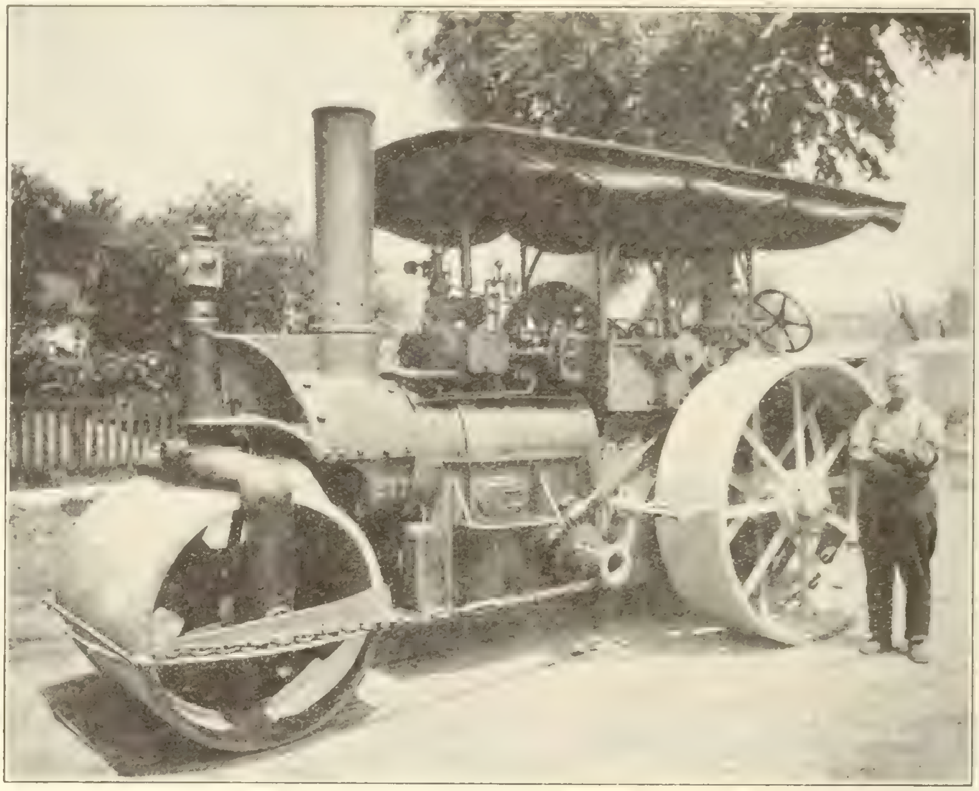

Worked Steadily for 22 Years and Only $200 Spent for Repairs

The value of long life and low upkeep costs is the most important consideration in the choosing of a road roller, for when the roller is laid up for repairs your whole road gang must quit work. Time out for repairs is a handicap Waterous roller users seldom experience.

Hundreds of users have found unusual service in Waterous Rollers, as the paragraphs show:

"We have a Road Roller purchased some 22 years ago and Mr. E. Plummerfelt has been engineer in charge of same since its purchase. The roller has never been sent to the repair shop. A few wearing parts have been replaced and two or three patches on the boiler plates have been made, but the total repairs since its purchase would not aggregrate more than $200.00. The Roller has proven an excellent machine."

"The Waterous Roller which we own has given entire satisfaction. The roller had seen considerable service at the time that we purchased it and we have now used it for two seasons with a total expenditure for repairs of $54.00. Early this year we equipped this machine with a Buffalo-Springfield Pressure Scarifier. This has more than doubled the utility of the roller."

"Our road roller has been in operation practically continuously since it was bought in 1911 and with only a minimum amount of repairs has given good satisfaction during that period. The approximate expenditure on repairs and renewals to date has been about $400.00. One feature that has been most pleasing to us is the fact that the wheels both front and rear show practically no wear at all notwithstanding the hard work to which it has been subjected."

"In reply to your favor of the 6th inst., in regard to the 10 ton Steam Road Roller purchased from you in 1906. We wish to say that the roller is still going strong and in addition to the work on the Town roads last season it was used on the County roads and in other Municipalities in this vicinity and was in commission working steadily for the greater part of the working season. Owing to some of the castings having become much worn they were replaced last year at a cost, for castings, labor replacing and general repair of $228.29. In other years the cost for repairs has been about $50.00 per year. We expect to have many years service from the roller and there has been no thought cf replacing it."

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ESTABLISHED 1886

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Better Chimney Construction Should be Required by Building By-Laws

During the past winter the fire loss throughout Canada has been heavy. Responsible authorities are attributing this condition in large measure to defective chimneys and flues, which opinion is substantiated by a perusal of newspaper items relating to fires and their causes. Sometimes, within a week in one paper as many as a dozen reports will appear that place the blame for destruction or damage on defective chimneys. To cite one example, Peterborough, Ont., is reported to have had 51 fires from that cause during the first two weeks of February alone. Thus it is evident that chimney construction has a great deal to do with the matter of fires and the extent of the fire loss.

There is evidence enough that poor chimney construction is extremely hazardous and warrants greater measures being taken to eliminate this element of risk by legislative action. Some progressive towns and cities have incorporated in their by-laws regulations governing the design and construction of chimneys, so as to make them fire safe. In the small municipalities and rural districts, however, there is no control over chimney construction, although the need is greater, because there is little if any provision for fire fighting.

This situation may be remedied by provincial legislation, or even county action. Some of the states across the line have promulgated state building codes which regulate all chimney construction regardless of municipal ordinances, with the object of protecting the rural as well as the urban dweller. In this country also, provincial legislatures might well direct their efforts towards combatting the defective chimney evil and so conserve life and property.

Several of the insurance rating organizations give preferential rates to municipalities that have ordinances covering chimney construction, because the fire records in such cases are not as heavy as in cities without such by-laws. Were better chimneys enforced generally, therefore, the cost of insurance would drop considerably.

So serious is the chimney hazard that at the commencement of this new building season, builders will be well advised to take it upon themselves to construct their chimneys in a fire safe manner. Surely a fire loss that is equal to 50 per cent of all the new houses built last year is enough to make people—and builders particularly—give some thought as to the means of combatting the evil.

Construction Industries Leading in Trade Revival

The construction industries unquestionably constitute a reliable barometer of business conditions. Building, touching as it does so many phases of the nation's activity at so many different points, is the most representative group in commercial life. The actual volume of new construction undertaken, together with the trend of building costs, therefore afford the key to the economic complexities of the coming year.

What, then, is the present position and the outlook for building in Canada? The course of construction operations points to a period of expansion. For the first quarter of 1923 the value of construction contracts awarded throughout Canada, according to statistics compiled by MacLean Building Reports, Limited, was $43,107,400, compared with $32,575,900 in 1922. It is when the figures are compared month by month, however, that recent developments are seen to advantage. Building operations in January totalled $9,840,800, in February, $13,311,800; and in March, $19,954,800. The tendency is toward activity in business and industrial building, the total for these two groups during the first quarter of 1923 amounting to $28,815,000, compared with $16,748,900. Residential activity is slightly less than last year, with the building of better class homes in evidence.

Building in Quebec has increased markedly, the value of work started during the first quarter of 1923 amounting to $13,344,300, compared with $6,741,400 last year. Ontario continues to lead all the provinces, the value of new work started this year so far amounting to $22,422,500 compared with $20,679,900 during the same period last year. Building in the Western Provinces totals $6,848,500 compared with $4,486,000 last year.

With building costs practically stabilized, a plentiful supply of mortgage money, efficient labor, and with the immense accumulated arrears of building postponed during the war and subsequent inflation phase to catch up with, the prospects according to MacLean Building Reports, Ltd., are bright for the most expansive period in building that Canada has yet witnessed.

Continuation of Federal Highway Grant is Important Topic Before Road Association

The importance which all the provincial governments of the Dominion attach to the question of a continuance of the Federal Government grant in the construction of main highways, is indicated by the decision they have reached to unitedly present the matter to the Prime Minister, the Hon Mackenzie King and the members of the Dominion Cabinet. This conference will probably have been held by the time this issue comes out. The Canadian Good Roads Association at its last convention in Victoria, B. C., passed a resolution reaffirming its approval of the principle of Federal aid in order to allow of the provinces to complete the comprehensive road policies that they undertook when the Canada Highway Act was passed, and which, owing to a variety of circumstances have not yet been finished. The executive of the Canadian Good Roads Association has since that provincial governments as to their demands and retime done a great deal to co-ordinate the different ceiving the promise of strong support from all of them, has arranged this conference with the Federal Government.

At the tenth annual convention of the Canadian Good Roads Association, which will be held at the Royal Connaught Hotel, Hamilton, from June 11 to June 14 inclusive, Federal aid will form one of the biggest questions that will be discussed by the delegates. A whole afternoon session will be given to the subject, and the officials hope at that meeting to be able to announce that something definite has been decided on, and that as a consequence road improvements will go ahead even more rapidly than before.

Have Not Completed Programs

Several of the provincial governments have not yet completed the preparation of their highway program for the year, owing to uncertainty regarding the Federal grants. Inasmuch as they contribute 40 per cent of the cost of approved main roads it can easily be seen they can undertake much more extensive work if assured of this grant than if left to their own resources. Up to the present only about 25 per cent of the mileage submitted by the provinces to the Federal Government for approval has been completed or is under way, leaving 14,138 miles yet to be built. The present Federal Act expires in March of next year, and it is impossible for the provinces to complete their approved schedules and secure the Federal allotment the Dominion Government agreed to give them in so short a time. In the three Prairie Provinces and Prince Edward Island alone the allotments amount to some $4,000,000, and it would be unjust to the great producing sections of Canada if they are not given time to earn their allotments—the same argument applies in more or less degree to all the other provinces.

The use of the highways has become so universal that the construction and maintenance of main and market routes is no longer a local or provincial matter, and while provincial autonomy is safeguarded in the selection of its main highways, and the type of construction used on them, the Federal Government should continue to bear a share of the responsibility in regard to cost. More and better roads not only mean better means of inter-communication, but are a direct benefit to the Federal treasury through the encouragement of trade and commerce, increased revenues from customs duties and the rural postal service and the taxes on the motor industry which will grow with the mileage of improved highways. The Federal Government made a grant of $20,000,000 spread over five years—the United States Government has alloted $540,000,000, of which $65,000,000 will be available next year, and $75,000,000 in 1925.

To quote from "The Canadian Road Builder," published by the Association, "Improved roads are helping to knit Canadians into a nation of common ideals. They are establishing a mutual understanding that cannot be over-valued. Good roads speak a common language which is understood by even the newest settler. A national consciousness can be built upon a foundation of mutual trust, and the establishment of such a trust will be promoted and hastened by a contribution coming from a central source and extending its benefits to every part of the Dominion."

This is only one of the many things that will interest the convention of the Association at Hamilton, for which has been adopted the slogan "Strictest economy in road construction and maintenance." Cost data will be another important subject. An insight of the value of the papers and discussions at these conventions can be obtained by a glance at the proceedings of the Victoria convention, just off the press, and which will be sent to all interested in the subject.

Error in Description of Roof

In the description of the plant of the St. Lawrence Paper Mills, in the Contract Record of March 21, the statement on page 270 that "the Canadian Johns-Manville Co. placed the gravel roof covering" is in error, inasmuch as this firm does not handle gravel roofs at all. The roof that was used on the job was the Canadian Johns-Manville standard, built-up asbestos roofing, smooth surfaced.

Unusual Boiler House for Henry Morgan and Company's New Store

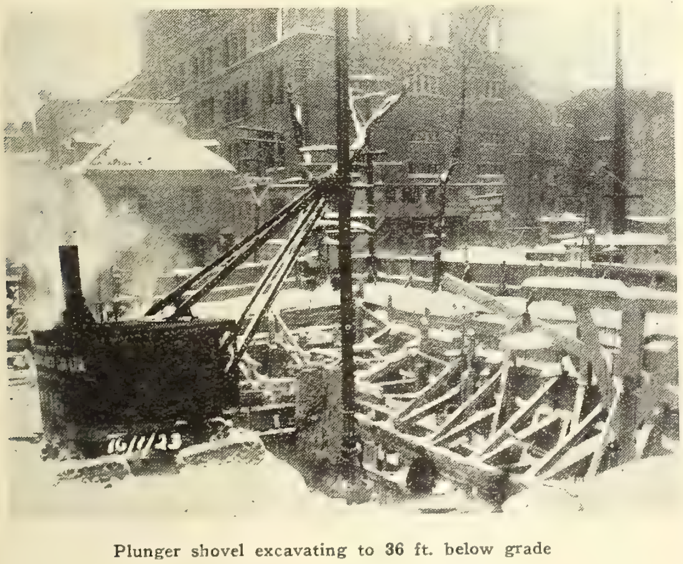
New Building Will Provide Increased Heat and Power Facilities for Extension to Store—Plans Provide for 10 Storeys Ultimately—Special Features of Design are Explained in Detail

Henry Morgan & Co., Ltd., one of Montreal's leading departmental stores, are now making very considerable extensions to their store by building onto the rear of the present store. In this connection they decided that it would be necessary to install a heating and power plant of greater capacity than the present one in order to provide for the much greater demands upon it resulting from the new addition. The new addition will have a greater cubic content than the present store, and in order to meet this increased demand for heat and power it was decided to build a new power plant and do away with the present system. At the same time they did not feel like setting apart any space in the store so have started a new building across Aylmer St. from the main store.

The site chosen for the new power station is on the corner of Aylmer and Mayor Sts. and comprises an area of about 106 ft. along Mayor St. and 76 ft. along Aylmer St. The company owns the whole block but at present are only going to use the area stated above, although tentative plans have been drawn for a 10-storey building to cover the whole block.

Design of Power Station

As stated in the previous paragraph, their ultimate idea is to erect a very large building but at present only a small area is to be used and only one storey above grade will be built. However the foundations which have already been installed are capable of supporting a much heavier load.



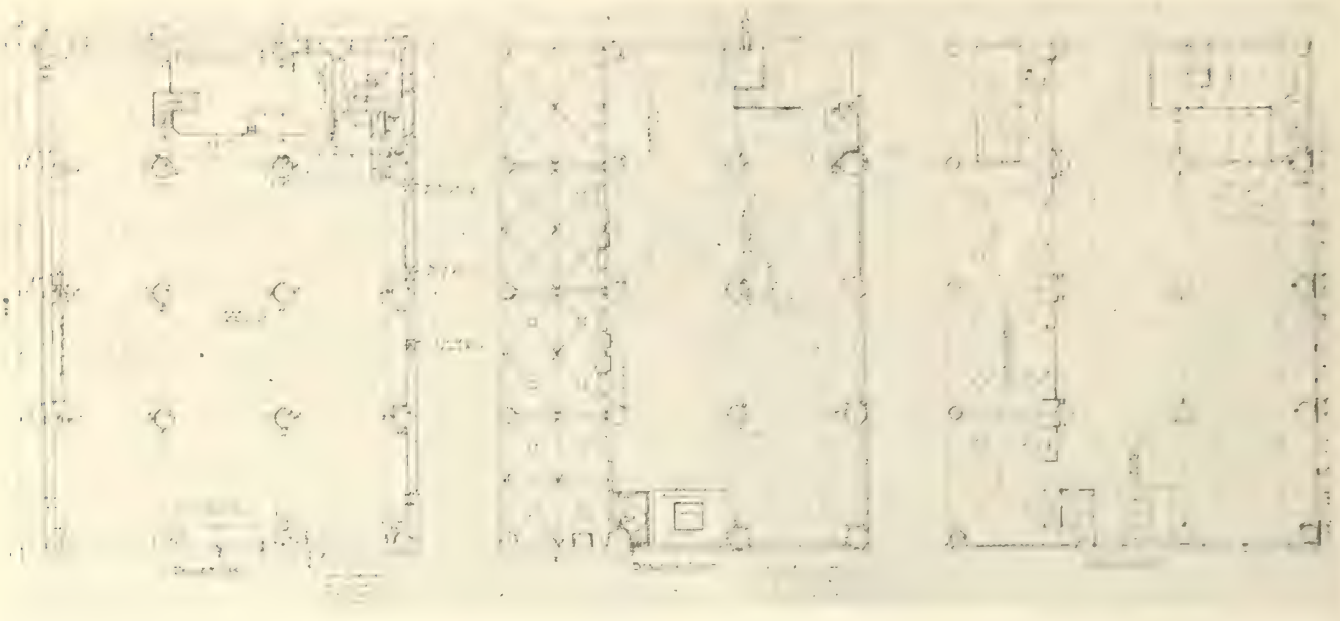
Plunger shovel excavating to 36 ft. below grade

Only a few of the facts and assumptions used by the Consulting Engineer, Mr. W. H. Wardwell, M. E.I.C., can be stated here. He assumed a live load of 150 lbs. per sq. ft. on every floor for 10 floors and a dead load of an equal amount to allow for the concrete floors which are of the flat slab type. With column centres 25 ft. apart in both directions this gives a load of 187,500 lbs. per column, per floor. There are 10 floors above grade and 1 floor below grade, i. e., 11 x 187,500 = 2,062,500 lbs. load at the base of each column. Add to this again the dead load in the columns themselves and we have roughly 2,200,000 lbs. load on the footing. After tests had been made to find the bearing capacity of the hard pan it was decided to set this at 10 tons = 20,000 lbs. per sq. ft., so that the footings under the columns are about 110-120 sq. ft. in area. This may be verified by considering the accompanying cuts which were obtained through the courtesy of Mr. Wardwell.

Handling the spoil. Raising trucks to street level

The boiler house which occupies one corner of the site is entirely below grade as shown, and on account of heavy equipment contained therein and additional concrete dead load, the footings here are somewhat larger. With the information obtained and experience gained in this construction work any subsequent work undertaken below grade should be a much simpler matter for the engineers.

The design adopted by Mr. Wardwell is interesting to consider. An examination of the accompanying cut showing the vertical cross section of the wall will serve to explain this method. The wall columns which are cast monolithic with the wall act as beams or girders supported at top and bottom by floors, one at basement level and the other at sub-basement level. At present the support or floor at basement level is not in place but the ground is not exerting any overturning moment on the wall due to the fact that it is frozen solid. The walls between the wall columns act as slabs also and are reinforced heavily in both horizontal and vertical directions. Thus the pressure on the wall between the columns is transferred in two directions, horizontally into the columns



Floor plans of the power house

and vertically into the floor slabs. The same is true on all four sides.

Design Along Mayor St. Side

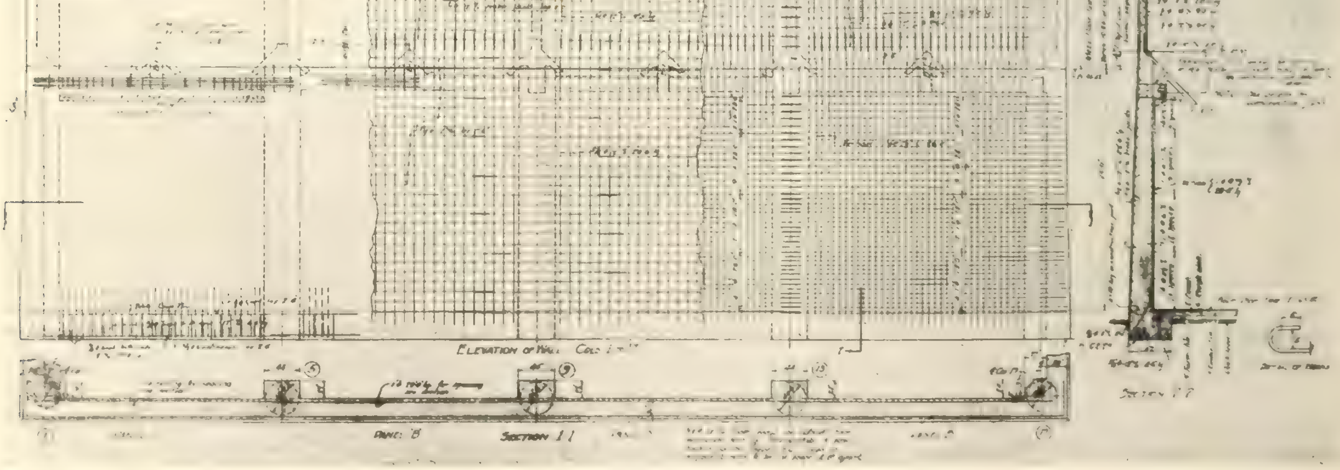
Along Mayor St., 106 ft. in length, is an open area way at grade level for teams and trucks to discharge coal into bunkers directly underneath. The outer wall columns are the only obstruction in this area way. Holes in the floor of this area way admit the coal directly into the bunkers, of which there are four, each one being separated from its neighbour by a concrete wall. Each bunker is made up of four sections or hoppers with a discharge hole in each, dumping into a coal chute leading directly into the mechanical stoker. The total bunker capacity is 400 tons.

The bunkers are carried on concrete girder beams around all four sides and secondary girder beams run between the hoppers. The plan shows the method.

The stress on the outer wall is carried across the bunker panel to the interior columns by means of heavy concrete beams, that is, those supporting the bunkers, and the interior columns in turn transmit the stresses to the basement floor. Thus it will be seen that no cantilever beams or walls are used to carry the heavier stresses exerted by the earth pressure. All the outer walls are of beam design supported at top and bottom by the floor slabs and at intermediate points in the vertical direction by means of vertical beams (i.e., columns).

Construction Procedure

About November, 1922 the demolition of the buildings occupying the site was commenced. This work was finished by the beginning of December as the buildings were old and easily destroyed and no attempt was made to salvage the materials, except the brick. Shortly after December 1 the excavation work was commenced, this work being undertaken in an area slightly larger than the area of the building in order to allow for the placing of sheeting and bracing to support the perpendicular sides. This work was done by a J. W. Harris excavator shovel dumping directly into trucks and wagons which drove right onto the site. This method was con-

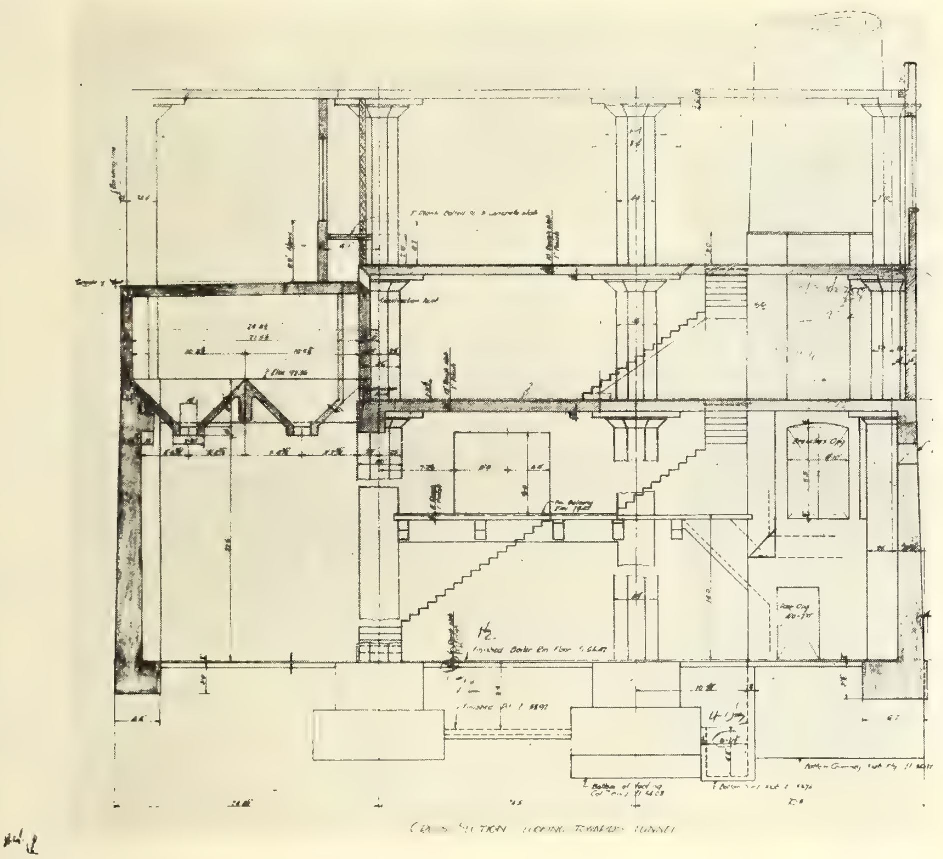


Details of wall

tinued down to a depth of 8 ft. below grade. When this level was reached a change in method was decided upon which necessitated a change in mechanical equipment.

During the previous summer a test pit sunk on the site had determined the nature of the soil which would be encountered during the excavation to sub-grade, i.e., column footings. At 36 feet below grade a layer of hard pan of high bearing capacity was found, which continued indefinitely or at least far enough down to warrant it being used as foundation material for heavy loads. It was this fact which was the main factor in deciding the methods of excavation subsequently adopted.

With complete knowledge in hand it was decided to put in the walls in the same way as one adopts in laying a sewer in a deep trench, i.e., to excavate the trench wide enough to accommodate the wall and the footing plus an additional width required to take sheeting and bracing to hold the sides in place.



Cross section of power house for Henry Morgan & Co. Ltd., Montreal. This view is looking towards the tunnel.

The contractors knew also that the best method of excavating under these conditions was by means of a plunger shovel which could be more easily and accurately managed in a confined space. The extreme reach of the plunger was 32 ft. below the level of the excavation. The depth of hard pan, which could not be handled by a steam shovel, was 36 ft. below street level. Hence, the reason for the preliminary excavation of 8 ft. below grade—in order to place the steam shovel at a level that would allow the plunger to reach the hard pan.

Excavation for Walls

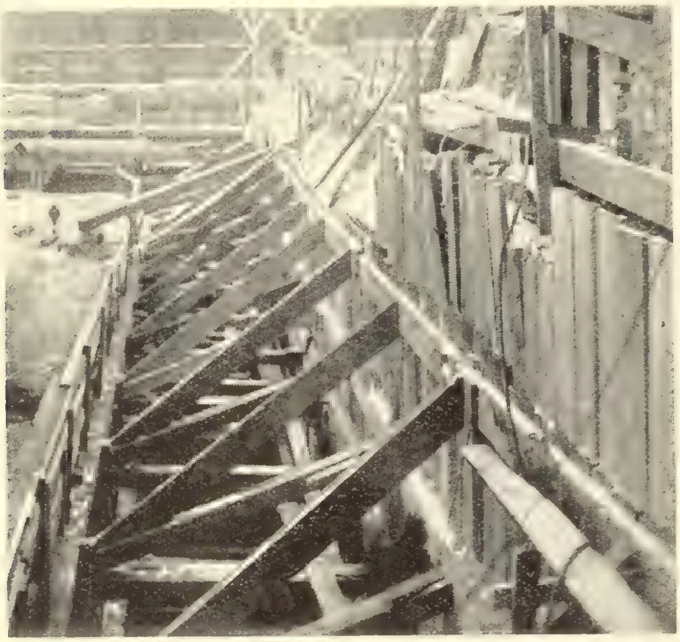
The alteration in equipment was started about the end of the first week in December and a day or two later a start was made on the trenches which were to accommodate the outside walls. The plunger steam shovel (J. W. Harris) was installed on the inside of the walls and loaded directly into trucks and wagons which drove up close alongside the excavation but remained at grade level.

The trench was sheeted and braced (see cut) in the conventional manner to hold the sides in place as the material was soft blue clay and running sand. This class of material is very common in Montreal and must be carefully watched to prevent the danger of sliding and caving.

This sheet piling was driven down by means of a McKiernan-Terry air hammer and was always kept at least 3 feet in advance of the excavation to prevent the soft sand and clay from pushing in and up from the bottom of the trench. This also assured them against the narrowing of the trench as the work proceeded down.

In this manner the trench was successfully excavated down to hard pan as any unusual difficulties had been anticipated and guarded against, in consequence of the knowledge obtained from sinking the test pit. Hard pan was uncovered in all four wall trenches by the end of the 3rd week in December and the work of excavating the hard pan was well under way by the same time. All excavation in the trenches down to sub-grade was finished by New Year's Day and the wall along Aylmer St. was already poured. The hard pan was broken up by means of air drills which acted very much like mechanical pick-axes in breaking it up. A stiff-legged derrick operating a half yard orange-peel bucket was used to take the hard pan spoil to the surface. It was dumped on the site within reach of the plunger steam-shovel which picked it up and dumped it into the trucks. This system of handling material was very effective and no trouble occurred. It shows an example of efficient organizing ability. The remaining three walls were poured during the month of January so that foundation walls were in place from sub-grade up to basement level (34 feet) by the end of January.

The question of salvaging the sheeting and bracing was in some cases a difficult matter to decide, on account of the nature of the soil which was in some cases exerting considerable pressure. The sheeting on the outside of the wall was left in place in certain instances and concrete poured up to it so that it acted as a form. Bracing was all salvaged as it was taken out when the concrete had reached a point where it would act as bracing to hold the sheeting. All sheeting on the inside of the wall was salvaged later when the interior excavation was completed. The forms for the interior face of the wall were placed right to the bottom of the trench. In only one small area was it necessary to leave the struts or cross braces sticking through the wall to hold the sheeting in place. At this point they merely spread the reinforcing bars apart and added a few extra ones. About 80% of the material used for sheeting and bracing was eventually reclaimed.


The trench sheeting and bracing

Excavation of Interior or "Island"

About February 1st the method of excavating the earth remaining inside the walls had to be determined. It was decided to use the plunger shovel to excavate in an area large enough to allow for the installation of a heavy duty hoist or elevator and also for the shovel itself when placed at the lower level of the hard pan. This area was taken out down to hard pan by the plunger in the same way as in the trenches except that no bracing was used. When they reached this point the hoist was built in the desired position close to the Aylmer St. wall. The steam shovel was then skidded down the incline to the lower level after the plunger bucket had been removed and the gouge type substituted. The remaining excavation was handled by the excavtaor which delivered the spoil directly into the trucks, these being lowered and raised by the hoist. A Beatty hoisting engine was used to raise and lower the elevator.

This excavation proceeded smoothly and quickly, being completed to sub-basement level by the end of February. Excavation for footings was at once started and at the time of writing, footings are in, sub-basement floor is poured and interior columns are in place up to basement floor level. By the time this article appears the basement floor will have been poured which will bring to completion in record time an unusually tricky piece of construction work.

Quantities

A rapid survey of the cuts showing the plans will give a fair idea of the amount of excavation done in such a short time, amounting in all to about 13,000 cu. yds. This was all handled by a fleet of motor trucks belonging to the Minague Trucking Co., Ltd., of Montreal, who have recently developed a large organization of this nature and are doing considerable work in and around the city.

The quantity of concrete poured was about 1,200 cu. yds., and it is a remarkable fact that this was all being done during the same period of time as the excavation was made. The concrete is proportioned according to Abrams' theory of concrete proportions and the mixing plant was set up as near to the site as possible to avoid long runways.

The tonnage of reinforcing steel is high (about 100 tons) due to the fact that the stresses both on foundations and interior columns are very heavy. The columns have been designed for a 10 storey building with a fairly heavy dead and live load on each floor. The columns are on 25 ft. centres. These columns at the footing elevation are probably the largest in the city used in this type of building.

It would be a serious omission to fail to mention the names of those who designed, organized and carried out such an unusual piece of work so successfully. The designing engineer is Mr. W. H. Wardwell, M.E.I.C., of Montreal, under whose active supervision the work was carried on. The owners did their own work by day labor and the organization for this job was gathered together and directed by Mr. J. J. Shea, who deserves great credit for his efforts.

How the Shovel Operator can Check Grades

A quick and simple method in steam shovel operation of checking the grade given by the engineer is described as follows in The Excavating Engineer:

When you start in on a cut you are ordinarily sure of your grade. It is only later that you might begin to be doubtful as to how you are holding it. When you have obtained your grade, therefore, thrust the dipper of your shovel out to the stops and drop it to the ground; then have someone measure with a string the length of rope you have out between the pin of your padlock and the centre of your point sheave on the boom. Make note of this figure. It is obvious that if you are not keeping to this grade you can tell by measuring your rope again and comparing it with your first figure, providing you do it before you have moved up. If this figure is greater you are taking too much of a cut; ir it is less you are taking too thin a cut.

Preparation of Water for Filtration

The Problems Involved in Dealing with Water and Modern Ideas Concerning Their Handling – Intake Location Carefully Selected—Effect of Hydrogen Ion Concentrations

By F. A. DALLYN, C.E.* and A. V. DELAPORTE, B.A.Sc.†

Before the Canadian Section of the A.W.W.A.

It is the purpose of the authors of this paper to confine their remarks to a consideration of the existing water supplies for the municipalities of Ontario.

The sources of supply for municipal waterworks in Ontario are rather unique in that with very few exceptions they are known as "clear" waters. The Great Lakes and the connecting rivers, which form the major sources of supply are extremely clear, and such turbidity as occurs is of local origin, and as a rule is confined to a small percentage of the three hundred and sixty-five days of the year. The Lower Detroit is an exception to this and carries more or less turbidity during the greater part of the year. The Upper Detroit has some unusual conditions during the spring run-off, brought about by the enormous quantities of salmon-fly larvae, which are introduced from the creeks and shore waters of Lake St. Clair. Lake Erie, which is comparatively shallow, is more or less rile after every storm, and would have considerably more turbidity than is encountered in any of the other Great Lakes.

In addition to the Great Lakes and connecting rivers there is a considerable number of comparatively clear streams and springs, the source of which have considerable iron in solution. In Northern Ontario, and associated with the waters of the Rideau and Trent Valleys, there is quite an amount of organic matter and definite colour. These waters again are comparatively clear, except as influenced by the spring run-off and the effect of the organic matter thrown into suspension by convexion currents, or due to stream velocity affecting the deposit of suspended matter.

Besides these, there are a few sources of supply, such as the Thames and the Grand Rivers, which carry considerable amounts of turbidity and which rank as hard waters.

Problems Involved in Dealing With Water

The problems of filtration, dealing with such waters confine themselves in the main to three problems:—

(1) The removal of bacteria, introduced from sewage contamination.

(2) The removal of occasional turbidity.

(3) The removal of colour and organic matter and, for a few of the supplies the removal of considerable quantities of turbidity.

Economically the problem in the main is a problem of the removal of colour in the Northern parts of the province; and for the Trent and Rideau valleys, the removal of iron and the removal of occasional turbidity.

The operation of filtration plants for the removal of over 95% of the bacteria, introduced by sewage pollution, from the clear waters of the Great Lakes, has lately been a controversial subject. There appear to be two schools of thought. One is represented by the works managers and economists, who insist that, without impairing the appearance of the water great economy can be effected by reducing the bacterial efficiency of the filtration process and supplementing the treatment by sterilization through the use of chlorine, ozone, or ultra-violet ray. The other school is represented by certain public health officials, who take the position that in connection with our water supplies we cannot have too great a factor of safety, and that filtration should be formed in as efficient a manner as is possible with the highest bacterial removal consistent with the capacity of the plant; and that this should be further supplemented by chlorination.

In the larger plants, which can afford laboratory control, the former school undoubtedly have the advantage of the argument, since with our knowledge of the behaviour of chlorine as a sterilizing agent, we can ascertain with great accuracy the efficacy of sterilization agencies, by the colormetric determination of excess chlorine in the water. The plant operator knows if a certain excess chlorine exists in the water that the water is sterile and there is no occasion to wait upon the laboratory 24 to 48 hours to obtain the bacterial counts and results of the fermentation tests.

The Cost of Alum

The argument of economy is rather a difficult one to combat in these days of high taxes caused by our war indebtedness when it is realized that the quantities of alum required to give high bacterial efficiencies represent an annual expenditure considerably in excess of the annual amount of principal and interest charges on the capital cost of the plant itself.

One grain per gallon per plant capacity, applied daily, equals approximately the annual amount of the principal and interest of the plant, at 4½% 30 year debentures.

Where the water is to be treated with approximately 2½ grains of alum, the cost of alum alone is from two to three times the actual costs of the interest and principal in connection with the plant itself. The trend of practice, therefore, is toward decreasing the bacterial efficiencies of filtration plants of the rapid mechanical type and supplementing filtration by chlorination. This trend, whether in the right direction or not, fortunately at this time is not accompanied with very serious health hazards, owing to the fact that the last ten years have witnessed immense declines in incidences of typhoid fever, so that water supplies do not to-day represent the potential danger that they did in the last decade.

In the province of Ontario a great deal of emphasis has been placed and is still placed upon the location of points of intake for sources of supply. There was a tradition some years ago that American engineers were prepared to purify any source of supply and make it fit for domestic use. And while the writers do not wish to reflect at all upon the ability of the American engineers to design such plants, and have in fact witnessed such achievements, they do take issue with the practice of utilizing sources of supply, with a view to economy, which are far from satisfactory.

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In Ontario, the selection of the point of intake as a rule is determined upon only after a very considerable survey of the sources of sewage pollution likely to affect the intake. In consequence, there are very few plants in the Province, furnishing domestic water supplies, which have intakes subject to the gross pollution that is experienced in a great many of the American cities.

As a result of this, lapses in the purification processes do not tend to contribute the complement of typhoid fever which one would anticipate from the American situations, and it is also possible to operate these plants with considerably less supervision than is required of those dealing with highly polluted waters. The density of population in the United States calls for a size of plant, which is rather larger than the general run of plants in Ontario. This also is a factor in the extent to which supervision and laboratory services can be absorbed in water rates.

In order that the trend of design might follow more closely the present practices in operation of filtration plants, dealing with the clear, uncolored waters, such as are furnished by the Great Lakes basin, the writers believe that the discussion of the precipitation re-action of aluminum sulphate is a pertinent matter.

Heretofore, in standard plant design, it has been customary to provide sedimentation and coagulation basins for from two to eight hours' sedimentation. These basins represent from 10 to 30% of the total cost of the filter works. They were introduced originally to assist filtration by settling out a portion of the suspended matter, or turbidity. In many of the older works where treatment by chemicals and precipitation preceded treatment by filtration, the precipitation tanks were existent prior to the installation of the sand filtration works, and were merely made an adjunct to the new works.

The filter units themselves were of both the open gravity and the enclosed pressure type. It was also believed by many of the workers that economy could be effected in the quantities of alum used, if advantage were taken of the reacting interval of several hours, which fact, I believe, has been amply borne out in practice.

Dealing With Colored and Iron Waters

In Ontario, in dealing with the colored waters in the North, and in dealing with the iron-bearing waters, coagulation and retention tanks prior to filtration appear to offer distinct advantages, not only through economy in the use of alum, but, also, in providing a certain flexibility in plant management, permitting aeration and other adjuncts such as carbondioxide removal, sometimes found necessary in the treatment of these types of waters.

There are numerous instances in Ontario where pressure filters can be operated so as to yield a satisfactory water, but the difficulty of controlling the requisite alum dosage required for rapid precipitation is so great that this type of plant is not advocated for waters which may be classed as resistent to treatment.

On the other hand, there may be a field for this type of filter when dealing with the comparatively clear water of the Great Lakes basin since they are capable of preparing it for effective chlorination and are also available for the removal of occasional turbidity, provided a suitable laboratory force is available to regulate the administration of chlorine and the requisite dosage of alum and chemicals necessary when dealing with periodic turbidities.

The question which naturally arises as to whether the saving of 15 to 20% of the capital cost of the plant is warranted, when it throws the burden back upon the laboratory, is a debateable one. 15% of the capital cost represents in annual operation approximately one-tenth the total cost of the water as delivered from the pumping station to the distribution system, so that the item is not possibly as large as one might anticipate.

Optimum Value

During the past year the Board has been carrying on special investigations in different parts of the Province with a view to determining if possible the optimum condition of the raw waters associated with coagulation, using aluminum sulphate. The experimental evidence in our possession would indicate that for the soft, colored waters the optimum is when the natural water has a hydrogen ion concentration capable of adjustment through the use of alum to a pH value 5.5 and that for the harder waters and the Great Lakes basin the optimum condition is when the pH value is adjusted to the neighborhood of 6.5.

The recent report of Theriault and Clarke appearing in Public Health Reports for February 2, 1923, under the caption "The Experimental Study of Hydrogen Ion Concentrations to the Formation of Floc in Alum Solutions" is a notable contribution to the subject. They were able to show that the time of the first appearance of the floc in mixtures of alum and water containing definite salt concentrations behaves according to an equation, which is graphically represented by a parabolic curve; the axis of the parabola is oriented at right angles to the abscissa the optimum pH value. In solutions having a high alum concentration, the parabola appears to have a wider curve than where the dilute solutions are used, the practical application of this phenomena being that the hydrogen ion concentration range in which precipitation occurs is very much more limited for dilute solutions than for solutions of a higher concentration, and it is also apparent from reference to the curve that as one progresses from the optimum pH the time for the first appearance of the floc increases up to a point where the curve becomes practically perpendicular to the abscissa, so that beyond the confined range, in which precipitation is observed to occur there appears to be no hope of precipitation, even if the time of interval be prolonged indefinitely.

The use of salts other than alum for the adjustment of the hydrogen ion concentration has not as yet met with a great deal of success. The two salts most commonly used for this purpose, sodium carbonate and lime, both have an unfortunate effect on the formation of floc. Under certain conditions the aluminum hydrate apparently acts as an acid, re-acting with calcium hydrate to form a calcium aluminate and it would, also, appear to react with sodium carbonate and bi-carbonate to form a sodium aluminate or some other compound. These reactions, which are reversible, have not yet been carefully worked out, but it is safe to assume that there will be a loss of alum floc in the presence of free hydroxide and generally in the presence of sodium salts of the rather weak carbonic acid.

Mechanical agitation of sand such as in the ver Mehr filter, does not, in the writers' opinion, accelerate precipitation appreciably. Theoretically, it may, but the probability is that the presence of a large volume of sand in the filter has considerably more to do with precipitation than the movement of the sand, so that in actual practice there is very little to choose between the precipitation efficiency of the ver Mehr filter, does not, in the writers' opinion, acceler- and from the point of view, solely of chemical application, the theoretical advantage of the ver Mehr filter more or less disappears.

In summarizing the conclusions of the writers it would appear that the present trend of practice to operate filters, more or less as a screen for the protection of chlorination processes on our clear lake waters, is a sound one, in respect to larger installations, provided the laboratory facilities are adequate to keep a very definite check on the residual chlorine, and provided the situation is such that the secondary application of chlorine is possible, in order to correct any mischance in the dosage.

The use of sedimentation, or coagulation units having a minimum of two hours' storage is extremely advantageous for all colored waters and iron-bearing waters. For iron-bearing waters provision should be made for the addition of supplementary chemicals other than alum.

In this connection the experiments of Alfred Bechtel at Allentown indicate that it takes 30 minutes after the addition of calcium hydroxide, either as the powder or as milk of lime, before the calcium hydroxide is in true solution so that where lime is used to remove carbon dioxide the treatment must take place at least 30 minutes before the use of alum.

The pressure type of filter without coagulation basins is adequate, provided theoretical quantities of alum are applied to take care of occasional turbidity. If this turbidity is of frequent appearance, or persists for any considerable interval of the year, such as a month or several months, it is our opinion that the addition of coagulation tanks and sedimentation is economically sound, and lends itself to plant management.

For the removal of excess carbon dioxide following the use of alum, it is recommended that the water be treated after filtration with the requisite quantities of sodium carbonate or lime.

Conference With Government on Apprenticeship in the Building Trades

The executive committee of the Association of Canadian Building and Construction Industries has been making definite progress with some of the questions left in its hands by the recent conference of the Association in Quebe.

The proposed plan of apprenticeship, and means for remedying the seasonal nature of employment in the construction industry, have received very favorable comment from employers, educational authorities, and the leaders of organized labor. On March 28th a joint deputation waitel on the premier and the ministers of labor, immigration and public works to bring these questions to their attention. The deputation consisted of Messrs. Pigott, Carswell, Anglin, Grieve, and Reilly, from the Association; Messrs Moore, Marsh, Ingles, Molineaux and Izzard, from the Trades and Labor Council of Canada; Mr. J. L. Kingston, acting for Mr. Hines, representative of the Royal Architectural Institute of Canada.

As a result of the conference the Employment Service of Canada is now making a survey of the probable need of mechanics in the industry in the various centres of Canada for the coming building season.

A memorandum was presented by the deputation which clearly stated the situation and suggested lines of action for remedial measures. This memorandum is as follows:

"It is the desire of this delegation from the building construction industry in Canada to place before you our views on the three following questions:—

"(1) Apprenticeship.—In our opinion, an apprenticeship plan or system for the several trades in the building industry is essential if we are to maintain an adequate supply of competent mechanics. We therefore earnestly request that your government will extend your aid to the various provincial governments in financing technical and practical training of apprentices by:

(a) development of the Juvenile Branch of the Employment Service of Canada;
(b) providing for use, for apprenticeship training, of funds paid to Provinces under educational Statutes.

"Seasonal Employment.—We wish to draw your attention to the general custom practiced, which makes this industry become seasonal, and which in our opinion is not warranted. This custom tends to create an artificial shortage of mechanics during the so-called building season, and unemployment during the remainder of the year. This lack of continuity of work discourages many from following this class of employment, and also tends to prevent the youth of our country from becoming apprenticed to this trade. We therefore respectfully request your government to arrange your building programme so that it may be carried on during the winter months, thereby stabilizing employment, and setting example to the building public that winter construction can be carried on.

"(3) Immigration.—In view of the statements made of probable shortage of building trade mechanics during the coming year, caused largely by the emigration of this class of workers to the United States, and probability of demands being made to the government for immigrants to be brought to this country, We respectfully request that:

(a) an immediate survey of actual requirements be undertaken;
(b) only such classes as are certified by the Employment Service of Canada to be required, to be invited to Canada.
(c) cognizance to be taken in deciding upon requirements, of the length of time for which employment can be reasonably assured to the immigrant, and the conditions of labor under which he will be employed."

Geo. Farmer & Sons, 45 Bertrand St., Ottawa, have received from the Ontario Highways Department a contract for 5 miles of macadam base road from L'Orignal westerly. The cost will be about $10,000 per mile. Work will start as soon as weather permits. The same firm also have a contract for 3½ miles of asphalt penetration on the Morrisburg and Ottawa Road.

The Early Completion of Toronto Harbor Improvements is Important

R. Home Smith, the Chairman of the Board of Harbor Commissioners, Reviews the Progress Made to Date and Outlines the Work Necessary in the Immediate Future—$6,500,000 Still to be Spent

The present status of the Toronto harbor improvements and the proposed developments for their completion were completely explained in an address to the Toronto city council by R. Home Smith, chairman of the board of harbor commissioners. It was Mr. Smith's statement that by 1928 the city can have a harbor development worth nearly $41,000,000 and a surplus of assets over liabilities of at least $14,000,000. Inasmuch as some of Mr. Smith's remarks are of very great interest, an abstract of his address is given herewith:

In September, 1913, the harbor commissioners let their contract for the main portion of their work, accepting the tender of the Canadian-Stewart Company for reclamation at 19¾c per cubic yard, and the contracting company thereupon built two of the most powerful hydraulic dredges in the world and expended in plant and equipment a sum in excess of one million dollars. In the opinion of our engineers, this price of 19¾c per yard was exceptionally favorable even for the year 1913, and it is clear that from the year 1916 to date the same contract could not have been made or renewed at a less price than an increase of close to 100 per cent.

In August, 1914, Canada was plunged into the world war and as time went on the difficulties of the situation increased. Labor and construction costs mounted to unheard of figures; financing was difficult and costly, labor was scarce and situations had to be met which had not been foreseen and for which there was no precedent.

The criticism is sometimes made that when the war came the work should have been abandoned or shut down for a period and we would, therefore, point out to you the conditions which governed the situation from time to time and which some critics with a gift for hindsight need now to be reminded of.

In the first place, it is well to bear in mind that the greater part of the expenditure was in reclamation by hydraulic pumping, for which we had an ironclad agreement at 19¾c per yard. If we shut down we not only lost the benefit of this contract, but rendered ourselves subject to a damage claim of formidable proportions.

Attention must also be paid to the fact that for a time there was serious unemployment in the city of Toronto, and quite properly we were urged to proceed, and in fact to increase our operations, and in view of this special situation we did so.

Lastly, I would emphasize that the city of Toronto and the harbor commissioners made an excellent arrangement with the dominion government when the order-in-council was secured at Ottawa. If the harbor commission had shut down its work at any time during the past twelve years it is evident the dominion government would have done the same, and I would point out it is all very well to talk about a shut-down for one year or two years or three years, but our fear always was that what would be entered upon as a postponement might prove a practical abandonment for the greater part of a generation and leave on this city's hands a partially completed undertaking like, for instance, the new custom house or the new union station.

Dominion Government Has Spent $6,500,000

Notwithstanding the difficulties, financial and otherwise, during the war and after, the dominion government kept faith with us, for during the past nine years it has expended on Toronto harbor $6,500,000. You will readily appreciate that each year the commissioners have pressed their case at Ottawa and that their unfailing success has not been wholly due to accident.

The dominion government's expenditure of $6,500,000 on the Toronto harbor in the nine years, since the year 1913, compares well with the total government expenditure of $2,000,000 in the forty-eight years from confederation in 1867 to the year 1913, and it also contrasts favorably with the total expenditures on all accounts made by the dominion government in Toronto either since 1913 or since confederation.

When the harbor scheme was undertaken, the commissioners were led to believe that the dominion government would shortly commence the construction of a new Welland Canal, substituting seven new locks for the twenty-five existing locks and providing in the new channel a depth of twenty-four feet in the reaches and of thirty feet over the lock sills, as against the existing channel of sixteen feet.

In 1912 Hon. Frank Cochrane announced in the Commons the undertaking by the government of the new Welland canal and the promise of its completion within five years. We have every reason to believe that, but for the war, this program would have been carried out to the letter. The fact, however, is that eleven years after this statement was made the Welland canal is still unfinished and the estimate is that it will not be completed until the year 1928.

We were entitled to rely and build upon a new Welland canal in actual use at a date prior to the completion of any large portion of our wharves and docks, and if the Welland canal had been completed according to schedule, conditions in the port of Toronto would to-day be very different.

Canals and a Viaduct Vital to Harbor Plan

As you are well aware, the important ports for shipment of American coal are located on the south side of Lake Erie, and that furthermore the size of a boat plying from these ports to Lake Ontario is controlled by the existing and inadequate Welland canal. With the present Welland channel, the largest boat coming into the city of Toronto from Lake Erie has a carrying capacity of 1,800 tons, whereas with the new canal it will be possible to operate into Toronto harbor boats having a carrying capacity of 6,000 tons or the benefit of three times the tonnage.

The importance of this unfortunate situation is emphasized by the fact that during the year 1922 there came by boat to the city of Toronto 55,000 tons of bituminous coal and by railway 1,300,000 tons. We have no doubt that the completion of the Welland canal will revolutionize existing conditions in the carriage of coal, wheat, ore and other cargoes. Meanwhile, we must have patience and put up with the unforeseen delay, but I would suggest that the city of Toronto and its harbor commission, and in fact the whole province of Ontario, should have a jealous eye upon the due progress of the new Welland canal to completion, and see to it that the delayed program is vigorously prosecuted.

On many occasions we have pointed out to the city council that the whole harbor scheme was predicated upon the construction of the viaduct. We took no idle promise on this, for before a contract was let on Toronto harbor we had in our possession an order of the railway commission providing for the immediate construction of the viaduct, and in addition we had a solemn agreement under the seal of the two railway corporations.

While in 1913 the commissioners had no definite assurance that the canalization of the St. Lawrence would be proceeded with immediately, it was felt by all concerned that the new harbor must be built upon the assumption that this system of canals would be completed within a reasonable time. Personally, I feel the time has now come when the province of Ontario and the city of Toronto should take a more active part in this connection.

The Present Situation

And now what of the existing situation? We have finished the reclamation and grading from the Humber to Dowling avenue, and you have paved and lighted the streets through that area. I am afraid that once an improvement is completed we are prone to accept it all too easily and forget the previous conditions, and I would, therefore, remind you that whereas, eighteen months ago, the two miles from the Humber to Dowling avenue was a sandy desert, it is now, even in its partially improved state, the pride of our citizens, and I would urge upon you that what has been accomplished in the last eighteen months must only be an earnest of what can be done during the next three to five years..

Coming eastward, we have reclaimed on our own and on city account, 100 acres of land from the easterly limit of the Exhibition grounds to Bathurst street, and we are asking you to complete the boulevard drive between these two points at an early date, so that this area of one hundred acres may be developed and put in use during the year 1924.

From Bathurst street to immediately in front of the harbor commission building, we have completed the harborhead walls and reclaimed between them and the old shore line one hundred and thirty-nine acres of land, of which one hundred and eighteen acres are available for commercial development. We have also completed the cribs for the harbor head line from the harbor commission building to Yonge street, but we have not as yet constructed the concrete superstructure, although we would have been through to Yonge street last fall but for the ferry situation, which required that we leave a gap in the wall for boat service.

The ferry terminals must be moved to the foot of York street, so that, by expending $277,000, we may make available the additional 15 acres of land on which we have already spent $800,000. It is clear we must at the earliest moment possible complete this area, which is only ten minutes' walk from the corner of King and Yonge streets, where land is worth upwards of one million per acre.

A Through Street

This year we are asking you to construct as a local improvement, the pavement on Fleet street from Bathurst street to Harbor street, and we are confident that with this work completed the following eighteen months will witness a commercial development on this area equal in degree to the transformation which has taken place at Sunnyside during the past eighteen months in another class of development.

It is quite clear that the boulevard drive from the eastern limits of the Exhibition to Bathurst street and the paving of Fleet street from Bathurst street to Harbor street must be completed promptly, for until these improvements are made our 139 acres from Harbor Street to Bathurst street lie idle, and we are also directly interested by reason of the fact that when the public are able to reach the waterfront at Harbor street and York street and use the completed driveway, we will secure increased revenues from Sunnyside.

We have done no construction work from Yonge street east to Cherry street. Under the viaduct agreement the railways agree to purchase all the waterfront properties from Yonge street to Cherry street to provide for the new viaduct right-of-way, and further the harbor commissioners under the agreement have an option to repurchase from the railways all the properties south of the new viaduct right-of-way at a price equal to one-third of the total cost of all the properties acquired.

We look upon this option as being a valuable one, and when the agreement is carried out, we propose to ask your assistance in exercising it.

You will observe from the plan a series of docks on this section. It has, however, never been contemplated that these should be built at once, although provision has been made for them as and when they are required. In the meantime, our proposal is that when this section of the waterfront is acquired we construct a temporary harbor head wall along the line striking the north end of these slips and then we reclaim the land between this temporary harbor head wall and the present shore line.

The commissioners are strongly of the opinion that this section from Yonge street to Cherry street must be completed at an early date, and for more than one reason.

First, because of the advantage to the city as a whole in having a modern and adequate cross-town thoroughfare from Woodbine avenue to the Humber, which will not only aid in the distribution of general city traffic, but will also be the main artery through the city of that great development which is bound to follow upon the completion of the Ontario good roads system from Montreal to Windsor.

Secondly, because the reclamation of this land and the construction of Fleet street from Yonge street to Cherry street will bring Ashbridge's Bay within ten minutes of the corner of King and Yonge streets on through thoroughfare, and will thereby justify values in the Ashbridge's Bay district of from fifty to one hundred per cent higher than will obtain so long as the entrance is by way of Front street and King street.

Thirdly, because the City of Toronto cannot, under any circumstances, permit the waterfront from Front street to Cherry street to pass into the hands of the railway companies and this will be the city's last opportunity to purchase on what we deem to be extraordinarily favorable terms.

$6,500,000 to be Spent

In the Sunnyside area we are apparently about through with capital expenditure, but it is safe to allow about $500,000.00 for further improvements.

On the section from Bathurst street to Yonge street, we will still have before us the completion of the wall from Harbor street to Yonge street and the reclamation of the land immediately behind it. There will also be some further capital expenditures on this section and an allowance is made of another $500,000.00 on this account.

From Yonge street to Cherry street, including the cost of the land, the construction of the harbor headwall and the reclamation, we estimate the expenditure will be $2,600,000.

In Ashbridge's Bay in order to completely reclaim the whole area and provide a bridge over the ship channel at Cherry street, we contemplate further expenditure of $2,300,000.00.

The total of the above expenditures to complete the harbor is $6,500,000. This expenditure must be made and the work pushed through to completion at as early a date as possible, and on this basis our estimate of construction expenditure is, for the year 1923, $300,000; and for the next four years, $1,550,000 per year.

To put the situation briefly, we have spent $17,131,965.69 on our share of the work. We propose to expend an additional $6,500,000, and to finish the work in five years at a total cost of about $23,500,000.00 and all this in face of the fact that during the year 1922 our revenue fell short of our expenditure by $806,557 exclusive of sinking fund payments.

Surplus of $14,000,000

You will note we anticipate that the value of the assets in the year 1928 will exceed the total expenditures, including bond discount and accrued carrying charges by $14,070,709, but you must not lose sight of the fact that in addition to this surplus of assets directly created the city will have secured other advantages for which not one dollar has been allowed in this statement and some of which are as follows:

This city, which at present has not one single through thoroughfare from east to west of more than 66 feet wide, will be provided with the site for the construction of a street 8 miles long, from the Humber to Morley avenue, the same having a minimum width of eighty-six feet, and this site will be dedicated over harbor commission lands, free of any cost to the city. If anyone of you has any doubt as to value of this asset, I would ask him to remember that the widening of Teraulay street for a distance of less than one mile cost the city $1,180,000.

2. The harborhead walls built by the commission, and the ship channel walls and the bulkhead line built by the Dominion government, provide the city of Toronto with the finest port on the Great Lakes, with eight miles of dockage and with an ultimate draught of thirty feet. Not one dollar is credited into the above statement for the value of this city of a great and new port facility. Can there be any question that the completed harbor will be worth to the city of Toronto many millions of dollars aside from the value of the land created.

Hydraulic dredging in the inner harbor is all cared for in the value of the land created on reclamation, but incidentally 9,033,000 yards of material have been dredged from Toronto Bay, all of which material would otherwise in due course be removed and dumped in the lake in order to deepen the port and the approaches to the docks. Our estimate is that this dredging would in ordinary course cost in the neighborhood of $3,160,000; in other words by the reclamation scheme every yard of dredging from Bathurst street to Cherry street has deepened the harbor at no cost for dredging.

We have taken the best advice obtainable, and we have carefully gone over our assets, our liabilities and our sources of revenue. In our opinion the real estate as ultimately improved and owned by the commission, will have a capital value of $37,894,465.00, and we will have buildings and equipment of a value of $3,025,244.55, or a total of $40,919,709.55. If we are right in this figure, then the whole scheme will be an economic success unsurpassed in a municipal enterprise of the kind, and will, aside from its economic aspect, make possible a magnificent boulevard drive to the Island a street eight miles long from the Humber to Woodbine avenue with a minimum width of eighty-six feet, a right-of-way for fast traction and radial entrances, and a complete rebuilding of the waterfront of the city which ten years ago was in a disgraceful state of dilapidation and will within a few years be the pride of the whole city.

Movement for the Standardization of Lumber Grades

Users of lumber are much concerned with grading standardization, to attain which efforts are being directed in the United States. They will therefore be interested in the announcement of a meeting of the Manufacturers Permanent Standardization Committee of the Central Committee on Lumber Standards at the Congress Hotel, Chicago, May 10, 11 and 12; also a meeting of the Consulting Committee on Lumber Standards at the same place, May 14, 15 and 16.

The purpose of the meeting of the Manufacturers Permanent Standardization Committee is to act on the plan tentatively agreed upon at the meeting of the Consulting Committee on Lumber Standards in Chicago, February 5-7, relating to the naming of the basic grades of finish, common, dimension and structural timbers, to apply to all items of lumber except shop or factory lumber. The plan suggested provides a sufficient number of basic grades to cover lumber of comparative quality from the various manufacturing regions. The grading rules committee of each regional lumber manufacturing association has been requested to make such readjustment in its grades as may be necessary to secure material of substantially similar quality and utility in the grades of the same name in the various competing species.

The Manufacturers Permanent Standardization Committee at its coming meeting will consider the suggested plan in the light of the recommendations received from the various regional grading rules committees. It will endeavor to make whatever changes are necessary in order to reach a satisfactory agreement on more uniform grading rules.

The theory underlying this suggested plan for securing greater uniformity is not to secure exact uniformity as regards provisions for allowable defect in each grade, but on the other hand, to secure grades carrying the same name in each competing species, having substantially the same usefulness for the chief purposes for which used. This would accomplish a more ready interchangeability of one species for another, which is of great importance now that the largest markets draw their lumber supply from different regions.

Each association has been requested to send to Chicago for use at these meetings, two samples of each of its present basic grades so that the committees may be enabled to form a definite and fair judgment of the fundamental differences in present grades of competing species. These samples will be of uniform size—3 feet long by 3 inches wide. The basic grades and names for lumber other than shop or factory lumber embraced in this suggested plan, are as follows:

Finish lumber—Finish A, Finish B, Finish C, Finish D. (4 basic grades)
Boards—No. 1 Common, No. 2 Common, No. 3 Common, No. 4 Common, No. 5 Common. (5 basic grades)
Dimensions—No. 1 Common, No. 2 Common, No. 3 Common.
Structural Timbers—Timber A, Timber B, Timber C; No. 1 Common, No. 2 Common, No. 3 Common.

The Consulting Committee on Lumber Standards at its meeting, which will follow that of the Manufacturers Permanent Standardization Committee, will consider the recommendations of the latter committee in regard to the basic plan mentioned above. It will also consider various other matters, an outline of which is now being prepared.

Prevention of Accidents is Profitable

The Responsibility of Employers and Employees in the Business of Reducing the Accident Hazard—Supervision Combined with Education is the Feature of Successful Prevention Work

An Address by R. B. Morley, General Manager, Industrial Accident Prevention Association, at the Annual Dinner of the Toronto Builders Exchange and Construction Industries

Some of you may possibly have the impression that safety work is a development of modern times but we find, in the twenty-second Chapter of Deuteronomy, a safety rule reading: "When thou buildest a new house, then thou shalt make a battlement for thy roof, that thou bring not blood upon thine house, if any man fall from thence." The oldest known safety law with a penalty attached to the violation thereof is in the laws of King Hammurabi of Babylon, who died in the year 2185 B.C. His law read: "If a builder build a house for a man and do not make its construction firm, that builder shall be put to death."

At first thought, there is apparently no connection between accident experience of the manufacturing industries and that of the building trades, yet an analysis of the last annual report issued by the Workmen's Compensation Board of Ontario, in addition to our own statistics and general information, indicates the contrary in the case and there is a very definite relationship.

Statistical reports are always dry reading, and while our Associations are not primarily interested in compilation of reports of this nature, yet certain records must be maintained to guide our efforts, otherwise we would be groping in the dark. An analysis of some 12,000 accident reports received in my office during the past twelve months from fourteen classes of industry in the province are, generally speaking, 70% non-mechanical and 30% mechanical, that is, accidents occurring through or by mechanical agencies. Further analysis along slightly different lines is also interesting; handling materials, including hand tools, will average fairly close to 60% of the total number of accidents reported, and falls of persons, including accidents caused through stepping on or striking against objects, average fairly close to 20% of the total. This leaves only 20% of all accidents unaccounted for but as these are spread through several miscellaneous headings, further consideration in view of the total is not necessary. This record, I believe, will check very closely with the accident experience of the building trades.

Preventive Measures

If you agree with me on these figures, might I suggest certain preventive measures of demonstrated value in dealing with this problem. In the first place, it is very essential that employers fully realize that they are responsible for the safety of their employees and that the assessment rates levied by the Workmen's Compensation Board each year are determined directly by the cost of accidents.

Going back again to cause of accidents, you will remember that non-mechanical accidents are 70% of the total and the second analysis of accident cost indicates rather clearly that the personal factor enters into about 80% of the total, hence every effort in accident prevention must include this factor and the sum and substance of the most outstanding feature of successful accident prevention is supervision combined with education.

Supervision that enters into hiring of suitable employees, supervision that will correct careless or unsafe practices, supervision that will warn employees of known dangers of work in hand, supervision that considers and protects known physical hazards and finally supervision that will protect the employer from the hazards of unsafe employees, and also protect this class of employees from themselves by utilizing the one last remedy that every employer has.

Second only in importance to supervision, but closely allied with it, is education in accident prevention, not only for employees but for employers as well, but this subject is, as I say, so closely connected with supervision that extended comment is not necessary.

Thus far, you will notice, I have only referred to primary costs of accidents, that is, assessments paid to the Workmen's Compensation Board. This, in many cases, represents only a fraction of the true cost to employers as the real cost is represented by the loss of services of injured employees and this is especially true whenever there happens to be a shortage of labor. Perhaps the largest employer in America estimates the cost of replacing an employee in his organization at between $45.00 and $50.00, and as the activities of this employer embrace practically every phase of industry in the country, it is quite reasonable to imagine your own costs must be equally high for the same thing. This cost can be used as a rough comparison when replacing employees laid up through accident. Add to this cost the effect of an accident on the efficiency of other employees on the job and then the true cost of accidents from the employer's standpoint can be appreciated. On the other hand, employees lose one-third of their average earnings besides undergoing the pain and suffering incidental to many accidents, or consider this from another angle—compensation paid employees who have sustained injuries while following their usual occupation is, at best, only partial monetary relief. Money payments can never restore life or limb.

Brief mention of the activities of the Industrial Accident Prevention Associations might possibly be interesting. The Associations are created under the authority of Section 101 of the Workmen's Compensation Act. In addition to Section 101, authority is given in Section 81 of the same Act, for the inspection of the various plants by the inspectors authorized by the Board. The Sections referred to have been fully complied with, and the Industrial Accident Prevention Associations have legal authority to operate within the limits of the Workmen's Compensation Act. This authority, you will notice, confines our efforts to accident prevention.

The objects of the Association in part are: "To co-operate with employers and employees in safety work and in a general safety campaign to reduce accidents and industrial disease, for the benefit of both employer and employee."

Trained Specialists Give Assistance

The primary connecting link between the Associations and the individual employer is the services of a group of trained specialists in accident prevention, whose sole duty it is to assist in solving accident problems, remembering always, however, that the general interests of all of the employers in any one class must be considered before the individual wishes of any single member of the class. The recommendations by our inspectors are made with the intention of assisting in cutting down accidents and so reducing compensation costs. Mention should be made here of the very few exceptions taken to recommendations, and employers are strongly urged to avail themselves freely of the services which these men can render as part of their regular work.

While this method of inspection is of great value, marked progress in accident prevention can be made only through the co-operation of employees, and to obtain this co-operation, it is essential that they become interested in this subject. For this purpose, carefully selected bulletins, illustrating known causes of accidents, are mailed to employers each month for posting in their shops. Extra copies of these bulletins are mailed free on request.

In dealing with the general question of accident prevention, one must divide it into two phases—the humanitarian side and the economical side—and there is no activity that the employer can undertake that will give him the same benefits on both of these items. Employer and employee are interested in accident prevention, as an accident does not benefit either side. The benefits that come from accident prevention work, properly carried on, are increased efficiency which, of course, means also increased output, and lowered compensation costs, resulting in satisfaction to both the employer and his employees.

You have, in Class 24, (that is, the Building Trades Class) something over 5,000 employers scattered throughout the province of Ontario. Some of these employers are in business the year round with a large force of employees. Some of them are small concerns and some of them work only part of each year. The rates in the class run from 50 cts. per hundred dollars of payroll to $10.00 per hundred dollars of payroll. Each one of these rates in the ten groups in the class is subject to revision and will go up or down as the experience of the group is bad or good. If, for instance, the brickwork and masonry group has had a bad experience in 1922, the rate will be increased from $1.80 per hundred dollars of payroll to a figure that will pay the costs, as the Workmen's Compensation Board does not require to take a larger sum from the employers than is actually needed to pay all the accidents for that year.

Profitable to Reduce Accidents

Leaving out, if you will, the humanitarian side of accident prevention work entirely, there is an excellent financial reason why every employer should insist upon a safe place for his workman, the guarding of machinery so far as practical, and the safety education of every man employed.

So that you may have a direct recommendation regarding this matter, my suggestion is that Class 24 create an accident prevention association under the authority of the Workmen's Compensation Act and arrange, through your accident prevention association, for a distribution of literature that will interest the employer in accident prevention work and the distribution of bulletins for posting on the various jobs throughout the Province. An organization of this type will not, in the first year, increase your costs to any extent and should reduce them in the second year and continue to reduce them provided the work is carried on on a sufficiently large scale.

It is a fact that employers to-day, in Ontario, can control very largely their compensation costs, that is to say, you can, if you will, reduce these compensation costs through accident prevention work.

An announcement is made that Wm. J. Savage has been appointed vice-president of the Heltzel Steel Form and Iron Co., Warren, O., makers of the well known "Armor Plate" steel forms for concrete work. Mr. Savage has been connected with the company for four years, for the greater part of the time as sales manager.

Plastered Mill Construction Buildings Not Favored by Vancouver Inspector

Reports That Dry Rot is Prevalent in Structures Where Timber Framing Has Been Plastered and Recommends Changes in the Building By-Law to Safeguard Timber Construction and Impose Limitations

Mill construction in Vancouver, B.C., over a number of years has been encouraged because of its fire-retarding or slow-burning qualities. Following extensive investigations, however, A. J. Bird, building inspector of the city, has gathered extensive data aiming to prove that mill construction which is plastered, or otherwise sealed, is presenting grave danger owing to decay, dry rot and risk of collapse. So general and grave is the situation believed to be by the building inspector, that he is urging the City Council to adopt a revision of policy where mill construction buildings are to be plastered. His report is as follows:

With reference to the new building by-law now in the hands of the legal department. I beg leave to draw attention to the question of permitting or enforcing the use of what is known as "mill construction" in No. 1 fire limits or in hotels, apartment houses, etc., above a certain size.

This type of construction briefly consists of masonry walls with solid wood floors and partitions not less than three inches in thickness and supported on wood post and beam construction. As its name implies, this type of construction evolved out of the necessity for factory or warehouse buildings which provided efficient fire retarding qualities at a less cost than fireproof buildings; and for this purpose it has proved eminently satisfactory.

Dry Rot Discovered

When this type of construction was extended to use of buildings intended for human habitation which necessitated plastering, thereby preventing a free circulation of air, ravages of dry rot became apparent.

Owing to the comparatively low price of lumber, the undoubted fire-retarding qualities and the fact that better fire insurance rates are obtainable, the use of mill construction for hotels, apartment houses and such buildings has become very prevalent, particularly on the Pacific Coast, and is provided for in most city building by-laws, including the present Vancouver building by-law. This by-law permits mill construction only as an alternative for fireproof construction in No. 1 fire limits and for buildings of certain occupancy throughout the city. It also permits solid timber construction, cement plastered or covered with sheet metal on the outside for light court walls.

Within the last two years numerous examples of dangerous conditions caused by dry rot in buildings of this type, not more than ten years old, have been discovered, causing the owners considerable expense in repairs. The serious feature of this defect is the difficulty of discovery owing to the concealed nature of the construction and the fact that beams or floors, which have been tested in one part and found to be sound, have proved to be entirely decayed in other parts. To show to what extent this condition exists, the building department has discovered numerous examples where portions of solid floors, posts and beams could be pulled out with one's fingers, this being particularly the case where timber used was unseasoned or was subject to dampness.

Referring to mill construction, the Insurance Engineers Eperiment Station, under the direction of the Boston Manufactruers Mutual Fire Insurance Company, points out that if plastering is to be put upon a ceiling it should be plain lime mortar plaster which is sufficiently porous to permit seasoning. The addition of the skim coat of lime putty is hazardous, especially when the top side is laid with asphalt paper. This rule applies to almost all timber as now delivered.

In Vancouver, where we have much rain and where timber is frequently in the building a week after the log is lying in the water, and where the use of hard wall plaster is practically universal, conditions to cause dry rot are accentuated.

Naturally the fire prevention agencies and insurance companies favor this type of construction, but where it is concealed, as pointed out above, the danger of decay, cost of repair, and risk of collapse is too great to ignore entirely, for the sake of fire retarding, and it would appear that more attention to prevention of the origin of fire rather than to the prevention of spread might more than compensate for the value of mill construction. In this regard the recent enforcement of regulations as to protection of heating chambers, isolation of shafts, and general fire stopping (draft prevention) and more ample and easy means of egress for the public or employees considerably reduces the necessity for such type of construction (where plastered) as may have existed prior to these regulations.

For the purpose of completing the new by-law, I would suggest for your approval, a revision of policy with regard to buildings intended to be plastered by permitting a more extended use of open joint construction; safeguarded by prohibiting structural timbers less than three inches in least dimension; the employment of asbestos between sub- and finished floors, the limitation of floor stress by division walls, and other safeguards, and also by reducing the height to which such buildings may be erected.

Prospects for Lumber Construction

"Lumber construction is still the lowest in cost," recently stated Wilson Compton, secretary-manager of the National Lumber Manufacturers Association. "In design, in fire resistance and in elimination of wastes, lumber construction is constantly improving. Gradually, unreasonably and unnecessary restrictions on the use of lumber in building codes are being modified to meet the needs of economy in safe construction. Nothing will accelerate this favorable development in building codes and in methods of construction, as much as further definite progress toward the more uniform standards of lumber sizes and lumber grades, which the industry is now formulating. With, as the president of the West Coast Lumbermen's Association has recently expressed it, 'our hats off to the past, and our coats off to the future, the lumber industry, if it pursues a wise course, may confidently look forward to a considerable period of profitable and satisfactory business."

Shortage of Building Labor

Its Effect on Construction Activity—What a Continuation of High Prices Will Lead to—Curtailment of Building Would be a Setback

"Predictions are being freely made that in 1923 the volume of building, on a valuation basis, will exceed even the high record of 1922," says Commerce Monthly, magazine of the National Bank of Commerce. "Whether or not these expectations will be realized," states the article, "depends on building costs. They are already high and the prices of building materials and wages are rising. Under these conditions, there is always the possibility that as a result of high costs, those who are using their own funds will prefer to delay building and that construction dependent upon borrowed money will be hampered by the unwillingness of lenders to accept current levels as a proper basis for long-term loans with the consequent restriction of such loans to so low a percentage of construction costs as will make it difficult for owners to finance their undertakings.

"Superficially the conclusion might be drawn that a famine of building materials and supplies is imminent, but such a conclusion omits the price factor. Buildings represent a long-time investment and over and over again it has been demonstrated that no industry is more susceptible than is construction to the effects of price advances. Since last March the upward climb of building material prices has been rapid. The U.S. Bureau of Labor Statistics building material index has increased 24 per cent.

"The building labor situation is similar to that of building materials. There is a shortage of labor, both skilled and unskilled. This is the combined result of the competition of industry and the restriction of immigration. The competition of machine industry has been perhaps the outstanding influence in the breakdown of the apprenticeship system. A boy can go to work in a factory and learn to operate a machine and in a few weeks may be earning as much as men who have been there as many years, whereas if he were apprenticed to a carpenter or a bricklayer, it would be several years before he could hope to earn full wages.

"The limitation on immigration has not only reduced the supply of unskilled labor but the number of skilled workers as well. The supply of skilled labor has been further limited by the difficulties which the foreign workman has to face. The strict laws against contract labor, and the high initiation fees charged by many of the building trades' unions (or even exclusion of foreigners from membership) have not been particularly enticing inducements to bring the skilled worker from Europe.

"The resultant shortage of skilled labor, combined with effective organization, has made for monopoly wages. There are reports of lathers asking for wage rates which will enable them to make thirty or thirty-five dollars a day; of plasterers who ask to be paid twenty dollars a day. Wages of ten, twelve, or fifteen dollars a day no longer excite comment. The practise known as snowballing and numerous jurisdictional strikes add to the cost of building. While wage scales in the building trades have been cut in most cities, wages paid have been determined by the law of supply and demand and they are now probably as high as they were at the peak prices in 1920.

"With stable prices and reasonable wages, a true shortage of building materials and of building labor would be almost certain, but rising prices and wages will operate to prevent the development of this condition. As building costs mount, they will reach a point at which home builders of small means cannot meet them. Already there are reports of cancellations of loans for this purpose because the amounts arranged for have proved insufficient to meet rising costs. Builders for industrial purposes and municipalities as well will hesitate and investors will be inclined to consider carefully the wisdom of placing funds in investments which hold increasingly doubtful promise of profit and of which the ultimate security may be in question.

"The effect of even a partial cessation of building activity would be far reaching. Unemployment of only a small proportion of the workers engaged directly or indirectly in the industry would inevitably result in lessened business activity. Curtailment of purchasing power coming as a consequence of unemployment in the building trades would be a severe setback to business."

Comparative Tenders for Toronto Sewer Work

Tenders have recently been received for the construction of relief sewers in the city of Toronto and work is to start immediately. Because the bids offer interesting comparisons they are listed below. For a sewer on Roncesvalles Avenue from a point 300 feet south of King Street to Fern Avenue, the following were the figures:—

Tender	Bulk Sum
No. 1	$ 86,006.00
No. 2	63,940.00
No. 3	108,328.00
No. 4	68,862.00
No. 5	58,809.00
No. 6	75,800.00
No. 7 (Commissioner of Works)	73,386.00

For another sewer on Roncesvalles Avenue, Fern Avenue via Roncesvalles Avenue and Geoffrey Street to Sorauren Avenue and on Westminster Avenue, Roncesvalles Avenue to Sunnyside Avenue, the bids were:—

Tender	Bulk Sum
No. 1	$ 98,600.00
No. 2	79,440.00
No. 4	79,573.00
No. 5	71,998.00
No. 6	87,400.00
No. 7 (Commissioner of Works)	96,860.00

The contracts for the construction of the foregoing relief sewers were awarded to the lowest bidders.

J. A. Findlay Leaves A. B. Ormsby Co. to Enter New Business

Mr. J. A. Findlay, for the past nine years vice-president and manager of the A. B. Ormsby Co. Ltd., has severed his connection with the company to go into business on his own account. The directors of the company have accepted Mr. Findlay's resignation with considerable regret. Mr. W. S. Cameron, who up to the end of 1922 was in charge of the western branches of the company has been appointed to succeed Mr. Findlay and took over the duties of the position on April 1st.

Mr. Findlay and Mr. Roberton, late of Roberton-Olsen, Limited, have purchased the plant and equipment of this firm, and are operating it as the Fireproof Door Company, Limited. Mr. Findlay started fifteen years ago with the old firm of A. B. Ormsby, Queen and George Sts., Toronto. He left there in 1913, and was brought back in 1915 to the A. B. Ormsby Company, Limited, as manager and later was appointed vice-president and made a director in the Metal Shingle and Siding Company, Limited, of Preston, Ont. He has had a very considerable experience in this line, and is well known to architects, engineers, and contractors. Mr. Roberton was for eight years factory superintendent for MacFarlane-Douglas Company, of Ottawa, and four years ago, came to Toronto as president and manager of Roberton-Olsen, Limited. He has had a wealth of shop and drafting room experience. The new company's plant is large and well equipped, centrally located, and certain to be quite a factor in the lines they make.

Mr. J. A. Findlay who has organized the Fireproof Door Co.

The Value of a Clean-up Campaign

Abraham Lincoln once said: "I like to see a man proud of the place he lives in." Community pride, cheer, contentment, health and thrift are pre-requisites of the town or city that forges ahead and no community can possess these valuable assets unless it is clean—inside and out—from cellar to roof and from humblest alley to public square.

Every municipal engineer should deem it a personal responsibility and part of his job to see that his community is clean, beautiful and orderly. To every engineer who feels this responsibility and wishes to make his community a better place to live in, and play in, we suggest a "Clean up Campaign"—not a spasmodic attempt to give your community an annual bath but a persistent, well organized effort in the interest of cleanliness carried out thoroughly and systematically, and followed up from day to day.

Away with the rubbish piles! Banish the plague spots! Clean up the streets and alleys! Cut the weeds, mow the lawns and trim the hedges! Repair and paint every building that needs it! Try and get all ruined buildings pulled down. These should be the purposes of a "Clean-up Campaign."

Arguments for It

No difficulty will be found in presenting arguments for a "Clean-up Campaign." Visitors from other places judge your municipality much the same way as the individual citizen is judged by the appearance of his home. The most progressive manufacturers will not establish plants in a community which is careless about its sanitation and surroundings. The best type of artisans desire to own their own homes and want these homes to be in sanitary districts. Rural residents who come to town for the education of their families appreciate clean surroundings. Where streets are clean, property will be kept painted. Where weeds are kept under control, gardens will flourish and land values be maintained.

How to Start

First get the support of other municipal officials. The medical health officer, the chief of the fire department and the chief of police should be glad to co-operate. Discuss the plan of campaign with them and then present it to the municipal council.

The aim should be to get the whole community working under the direction of municipal officials. Very little will be done if the public thinks the work will be done for them by the municipality.

The costs of the campaign may be met by arranging for the collection of waste paper, rags and other valuable junk. School children can be organized for this work. Get this material disposed of first and then arrange to collect rubbish for burial or destruction by fire. Teams and trucks will be loaned by business men if definite plans are made so that there is no loss of time. Work to a definite schedule. Remove the rubbish and clean up first. Cut weeds and brush and then, if possible, plant trees and shrubs, sow lawn and flower seeds, paint hydrants and repair fences.

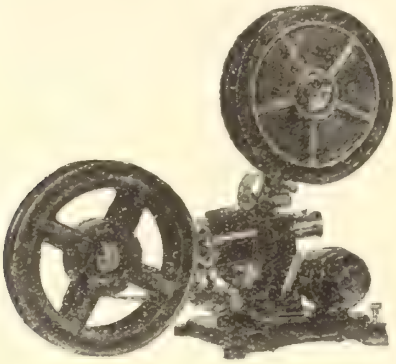
How to Continue

After a thorough clean-up, municipal officials should be able to keep their district fairly tidy throughout the year. Attention should be promptly given to tradesmen who litter the streets, trespass on the boulevards or haul material over the streets in defective wagons. Watch the corners where the newsboys congregate. Let them understand that papers must not be thrown on the streets; provide trash cans where necessary. Arrange for the proper removal of rubbish and garbage. This is a municipal duty and cannot be satisfactorily carried out by individuals. Keep ditches and drains open; dry roads wear longer than muddy ones.

The work of the municipal engineer will be better appreciated if he shows powers of initiation and leadership in the interests of public health and public welfare.—"The Pyramid."

The Cello Projector for House Use

As announced previously in the Contract Record, the Canadian Mead-Morrison Co. Ltd., Montreal, P.Q., are distributing in addition to their line, the "Cello Projector," which is a compact but practical motion picture machine for private use in houses, schools, lecture rooms, etc. Shown herewith is a cut of the projector which employs the same type of movement as the large theatre machines and is, consequently, very satisfactory from a projection point of view. It is claimed that the film cannot be set on fire and that still pictures can be shown on the screen without any damage to the film. The price, too, is reasonable. Pamphlet 701, issued by the Canadian Mead-Morrison Co., explains the details fully.

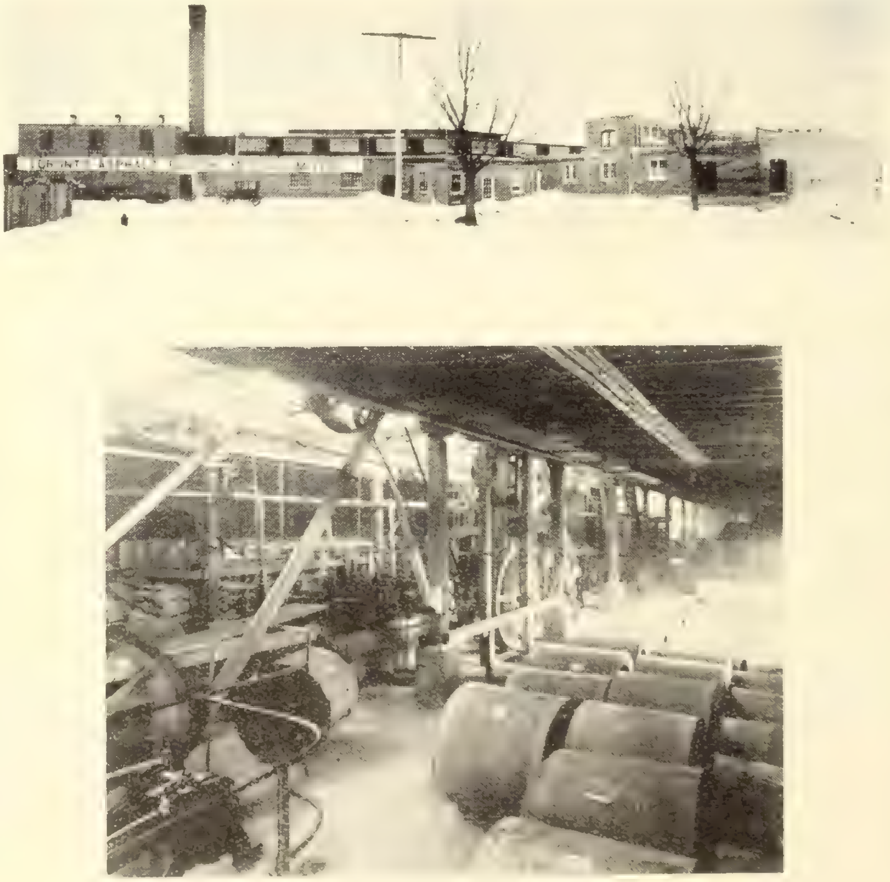


The Toronto Asphalt Roofing Mfg. Co.

Although organized only two years, the Toronto Asphalt Roofing Mfg. Co. Ltd., has enjoyed such a rapid growth of business that a large extension to the original plant has recently been necessitated. This gives the company a very fine manufacturing establishment at Mount Dennis, on the outskirts of Toronto, and indicates how great a demand has been created for substantial roofing materials.

The Toronto Asphalt Roofing Mfg. Co. Ltd., whose products, as indicated by the firm name, are roof coverings of asphalt composition, was organized in January, 1921. In May ground was broken for a plant at Mount Dennis and four months later operations commenced and have continued uninterrupted since that time. For the manufacture of Toronto Asphalt Roofing, an exclusive process has been developed, which gives, it is said, most excellent results.

The firm is headed by Mr. James W. Milne, who was for seventeen years general superintendent of the Brantford Roofing Co., Brantford, Ont. In this capacity, he developed, of course, a very intimate knowledge of the asphalt roofing business. J. J. Kelly, formerly industrial commissioner of Brantford, is vice-president; F. P. Turner, who has had many years experience in the hardware business, is secretary, and J. Dugdale, formerly of the Brantford Roofing Co., is treasurer. W. S. Milne is another director.



Upper: The plant of the Toronto Asphalt Roofing Mfg. Co. Ltd., Mount Dennis, Ont. Lower: A view of the interior

Mr. J. W. Milne, president

Mr. F. P. Turner, secretary

The Contract Record's

Weekly House Suggestion No. 64

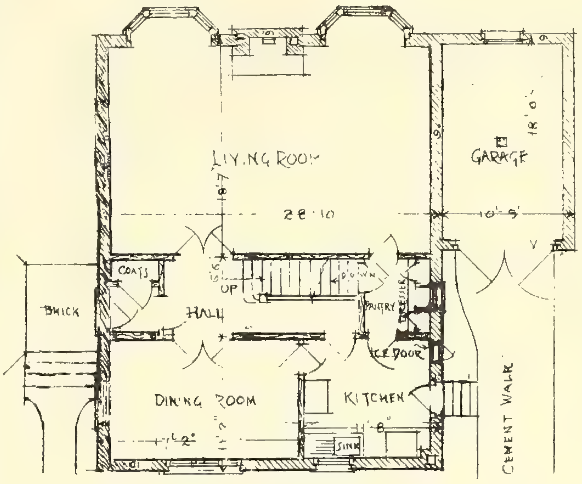
The residence we illustrate this week was designed for a location overlooking a ravine at the rear. The house is situated just outside of Toronto and was designed by Mr. E. Telfer Arnoldi, architect, Confederation Life Bldg., Toronto.

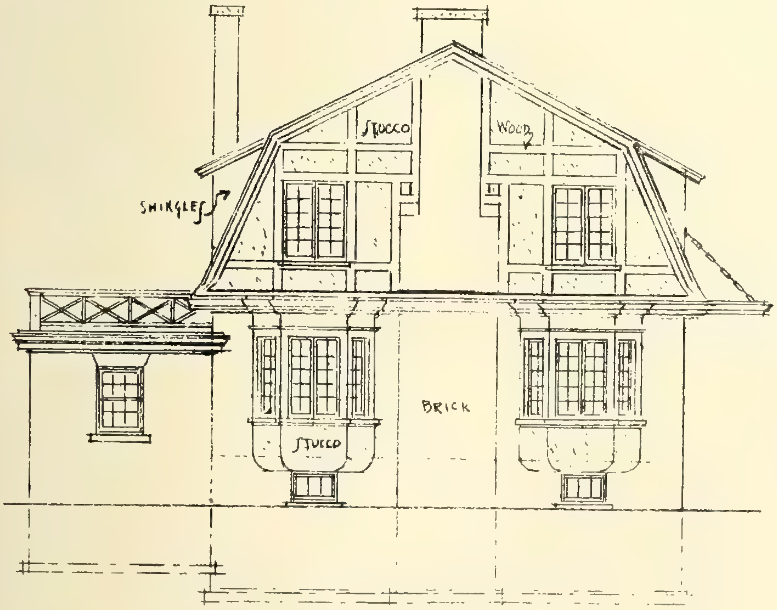
The exterior construction is brick on the first floor, with stucco and half timber above and wooden shingle roofing. There is a balcony over the garage, with entrance on the main bedroom at the side.

The main entrance is at the side on a cross hall. The entire rear half of the ground floor is given over to a beautiful living room which has two large bay windows overlooking the ravine. A handsome brick fireplace fits in very nicely in the rear wall between these two windows. There are convenient entrances off the cross hall to the dining room and kitchen. The first floor is trimmed throughout in gumwood and the floors are of oak.

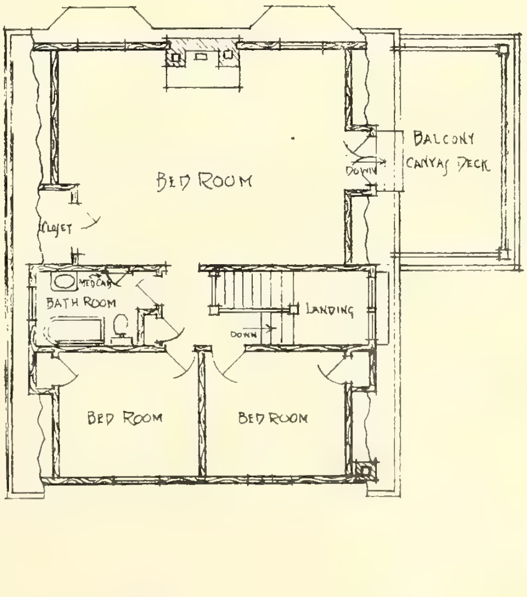
The bedroom layout follows somewhat the arrangement of rooms on the ground floor, the large bedroom at the rear taking up the same space as the living room. This room is also equipped with a brick fireplace in the rear wall between the windows. Hallway space has been practically eliminated in this plan, as a glance at the plan will show. The balance of the space on this floor is taken up with two good sized bedrooms and bathroom. The trim upstairs is finished in white enamel and the flooring is of oak.

There is a full size basement sub-divided into boiler room, laundry and coal space.





REAR ELEVATION



Mainly Constructional

East and West—From Coast to Coast

The Montreal Wood Mosaic Flooring Company, of Montreal, have moved their offices from 672 St. Catherine St. W. to 852 St. Catherine St. W.

J. A. Major Co. Ltd., wrecking contractors, of Montreal, will move their offices on May 15th from 16 St. James St. to 308 St. Nicholas Bldg.

A recent announcement states that J. A. Doidge, of 261 Ottawa St. N., Hamilton, will construct a plant on Kingston Rd., Toronto, for the manufacture of concrete blocks, sills and other concrete products. Work is to commence at once.

The Danforth district of Toronto is looking forward to another boom year in home building. One firm has completed the first of a program of 125 bungalows. This house has been completely furnished and is open for inspection by the public. Another builder is shortly starting on the construction of 40 houses in this district and many others have indicated their intentions to build many houses here later on in the season.

A construction force of 100 men are at work on the new C.P.R. shed at Fort William. The work of driving piles has been completed and the construction of the super-structure will be rushed so that the shed will be ready when the navigation season opens.

A recent notice is to the effect that the hospital for incurables, of the Sisters of Providence, Montreal, which was destroyed by fire recently, will be rebuilt and also a new building for tubercular patients. The two hospitals will cost about $1,000,000.

The Canada Bread Company has purchased a site alongside their present plant on Pears Avenue, Toronto, and will build an extension to cost about $100,000.

The Ravina Ice Arena, at the corner of Jennings St. and Rowland Ave., Toronto, will be replaced by a new artificial ice arena this year, according to a recent announcement. The new building will have a seating capacity of 5,000 and an ice surface 185 x 85 ft.

S. B. Green, well known Toronto home builder, is looking forward to an active season in house building this year, his program including the construction of thirty-five detached residences, of the $10,000 type, on the Moore Park estate; seventeen detached $20,000 homes on property purchased from the Eaton estate in the St. Clair and Bathurst district, and five $12,000 homes on the Glebe Manor estate, stop 9, North Toronto.

Algoma District, Ont., has been agitating for a railway line into the Mississauga Forest Reserve. Two reprsenetatives from the district were informed by Premier Drury recently that the government intends making an estimate of the amount of timber in the reserve to see if it is sufficient to justify the construction of a line.

Enlargement of the former Grand Trunk elevator at Windmill Point, which was taken over recently by the Montreal Harbor Commissioners, will be commenced immediately and completed about August 1 next, according to a statement by M. P. Fennell, general manager of the port. The present storage capacity of the elevator, known as elevator "B," is 2,130,000 bushels, and it is intended that this shall be increased to 3,250,000 bushels. In place of the two grain-loading berths now existing at this elevator, the enlargement will enable grain to be supplied to six ocean vessels simultaneously at the rate of over 100,000 bushels an hour. Work on the extension will be carried out under the direction of the port engineering staff, and is expected to cost approximately $750,000.

There were 653 permits issued by the City Architect's department, Toronto, last month, and 861 in March, 1922. The total value of permits was $3,068,318 last month, as compared with 2,883,335 in March, 1922. The total value of permits to date this year is $6,705,172, as compared with $5,750,964 up to this date last year. Included in the March permits for the past month are 527 brick dwellings, valued at $1,911,300; two factories, $6,300; 167 garages, $58,815; 18 stores, $587,500; one church, $64,000, and five frame dwellings, $10,300.

Peel County, Ont., received $41,749.77 as the amount paid by the Ontario Legislature on good roads construction during 1922. This total was divided as follows: Albion, $22,151.24; Caledon, $15,945.35; Chinguacousy, $33,709.71; Toronto township, $39,963.34; Toronto Gore, $11,156.30; Brampton, $9,530.28; Streetsville, $1,017.49; Port Credit, $1,950.63; Bolton, $2,668.20. The townships and municipalities paid out for good road construction and repairs as follows: Albion, $11,515.88 and $5,594.51; Caledon, $9,468.93 and $3,903.60; Chinguacousy, $18,833.84 and $10,683.18; Toronto township, $24,107.40 and $11,558.41; Toronto Gore, $7,874.51 and $1,563.41; Brampton, $2,509.55; Streetsville, $128.61; Port Credit, $129.14; Bolton, $1,686.17.

An early start is to be made on Ottawa's new artificial ice arena. The new structure is to have a seating capacity of 10,000 and an ice surface 80 x 200 ft. The contractors are bonded to have the building completed by Nov. 1 this year.

The Provincial Board of Health, of Ontario, is co-operating with Bridgeburg and Fort Erie in regard to providing facilities for a municipal sewage system in Fort Erie, and a plan, jointly prepared by engineers Redfern and Dallyn, of Toronto, was presented to the Bridgeburg Council recently. The plan is satisfactory to Bridgeburg; Fort Erie Council have yet to pass on it.

Personal

Mr. Maurice W. Summerhays, of Toronto, has been retained by the Argonaut Gold, Limited, to co-operate with the company's engineer in the designing and erecting of a new 200-ton mill at the company's property.

D. H. Fleming, city engineer of Owen Sound, Ont., has been appointed head of the works department of his city. Council at a recent meeting approved of a suggestion made by one of its members that the system of one-man control be adopted in Owen Sound, as it had met with considerable success at other points where it had been installed. Mr. Fleming has had several years experience in the various branches of municipal engineering and is quite capable of assuming the extra duties and responsibilities.

Obituary

Mr. Wm. E. Doran, architect of Montreal, died at his home in that city a few days ago.

Trade Incorporations

Kenilworth Building Co. Ltd., with head office at Toronto, capital $40,000, to carry on a building and real estate business and to deal in builders' supplies.

Doolittle Russell, Ltd., with head office at Hamilton, capital $100,000, to carry on a road contracting business and to deal in road materials and builders' supplies.

Ross & Brazier Construction Co. Ltd., with head office at London, capital $40,000, to carry on the business of railway, bridge and road contractors.

CONSTRUCTIONAL ACTIVITY

Period of April 4 to April 10, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Casselman, Ont.
Town Council contemplates a roadway costing $5,000. Work planned to go ahead in June.

Chatham, Ont.
City plant will supply 34,000 sq. yds. of asphalt required for re-surfacing pavement at a cost of $23,299.

Eastview, Ont.
Sewers planned by the Town Council, will cost $33,345. Councillors, Lepage and Brunette, interested.

Sidewalks costing $7,600 planned by the Town Council. Councillors Lepage & Brunette, interested.

Elmira, Ont.
Extensions to waterworks, proposed at a cost of $16,000, will include a new concrete reservoir, 6" mains, new roof on old reservoir, new motor pump, hydrants, etc. J. H. Ruppel, clerk.

Hamilton, Ont.
Tenders are expected to be called shortly for sewers estimated to cost $11,661. S. H. Kent, clerk.

Levis, Que.
Plans are being prepared for a filtration plant costing $100,000. Lionel Lemieux, City Hall, clerk.

Lincoln County, Ont.
County Council is receiving tenders until April 16 for a macadam road. F. N. Rutherford, engineer; Camby Wismer, St. Catharines, clerk.

Prince Edward Island.
Tenders for grading and concrete structures will be received by the Provincial Government until April 27. L. B. McMillan, Charlottetown, secretary.

St. Damien de Brandon, Que.
Camille Boluc contemplates a $2,500 aqueduct and wants prices on 4" cast iron pipe.

St. Louis de Chambord, Que.
Municipal Council plans a $100,000 waterworks system and is receiving prices on pipe. J. F. Grenon, Chicoutimi, engineer.

CONTRACTS AWARDED

Chatham, Ont.
Canadian Des Moines Pipe Co., Inshes Ave., have a contract for pipe for watermains to be laid by the city at a cost of $2,496.

G. Conibear, 265 St. Clair Ave., has a contract for concrete for pavement to be laid for the city. The city plant will supply asphalt. C. H. R. Fuller, clerk.

Contract for pipe for a watermain costing $3,386 awarded by the city to Canadian Des Moines Steel Co., Inshes Ave.

Lancaster, N. B.
R. M. Tobias, St. John, has been awarded the general contract for concrete arch culvert and roadway embankment for the Provincial Government.

Ottawa, Ont.
Contract for culvert pipe awarded to Barrett Bros., Catherine St., by the Ottawa Suburban Roads Commission.

Province of Quebec.
Louis Zuttin, Point au Pic, has the general contract for a portion of the Quebec-St. Simeon Highway at $15,000.

Provincial Government has awarded the general contracts for Levis-Rimouski Highway, Lauzon 1.71 miles concrete and Lauzon, 3.92 miles macadam to T. E. Rosseau Ltd., 229 St. Joseph St., Quebec, at $130,000.

St. Catharines, Ont.
A. E. Rigby, Bank of Toronto Bldg., Toronto; G. L. Campbell, 569 Victoria St., Montreal; Sir Wm. Arrol & Co. Ltd., Glascow, Scotland, have contracts for work on the Welland Ship Canal. One or two additional contracts may be let this year. P. Lyall & Sons Construction Co. Ltd., Montreal, general contractors.

St. Cecile Parish, Que.
Bituminous macadam roadway one mile long to be built for the Town Council. Hermenegilde Lapierre, Valleyfield, has the general contract.

Wateloo Co., Ont.
Lichty Bros., Wellesley, have contracts for roadwork in Wateloo County.

Railroads, Bridges and Wharves

Curran, Ont.
Work will commence shortly on a $15,000 bridge for the Township of Plantagenet. R. Lalonde, Plantagenet Springs, reeve.

Lachine, Que.
Tramways Commission, 107 St. James St., Montreal, contemplate a car line from Lachine to Dorval. J. F. St. Cyr, president.

Mono Twp., Ont.
Township Council contemplates bridge. Wm. A. Henry, Mono Centre, clerk.

Mornington Twp., Ont.
Wm. J. Zoeger, clerk of Newton Township, which contemplates a bridge.

Peribonka, Que.
Repairs to a wharf, costing $4 500, contemplated by the Dominion Government. R. C. Desrochers, secretary, Ottawa.

Point au Pic, Que.
Dominion Government contemplates spending $18,000 on improvements to the wharf. R. C. Desrochers, secretary, Ottawa.

Pointe a Elie-Magdalen I., Que.
Repairs and improvevments to a wharf planned by the Dominion Government will cost $5,850. R. C. Desrochers, secretary, Ottawa.

Riviere Joseph, Que.
Town Council contemplates a bridge and may call tenders in July. L. Levesque, secretary.

Ste. Marie de Monnoir, Que.
Town Council is receiving tenders on a steel bridge 170 feet long. H. Ste. Marie, Marieville, secretary.

Varennes, Que.
Tenders are being received, no closing date set, for alterations and repairs to bridge for the Town Council. Cost will be about $2,000. I. E. Vallee, Department of Public Works, Quebec, engineer.

Waterloo, Ont.
Ratepayers will vote on a by-law on April 21 covering a 20 year franchise for the Kitchener Light Commission. If passed commission will double track King St. from Union to William Sts. at a cost of $20,000.

CONTRACTS AWARDED

Cheneville, Que.
The contract for a wooden bridge costing $3,500 awarded to Gideon Fournier, Cheneville.

St. Arsene, Que.
H. Morin, Trois Pistoles, has the general contract for concrete and steel bridge costing $17,000, for the County Council.

Vaughan Twp., Ont.
Highland Construction Co., 72 St. Mary St., Toronto, have the general contract for a bridge costing $2,000. Frank Barber & Associates, 45 Jarvis St., Toronto, engineers.

Waterloo Co., Ont.
Contract for a bridge in Waterloo County awarded to A. Fraser, New Hamburg.

Public Buildings, Churches and Schools

Armagh, Que.
$50,000 church contemplated by the Roman Catholic parish. Curate, Rev. Mr. Cote. Architect not yet appointed.

Beachburg, Ont.
Tenders for the proposed public school will be received until April 14. W. C. Keighly, Pembroke, architect.

Buckingham, Que.
$250,000 church contemplated by the

Roman Catholic Congregation. Rev. J Chatham, interested

Carp, Ont.
Tenders for a Public School addition, costing $10,000 will be received by J. P. MacLaren, 104 Spark St., Ottawa, until April 14.

Coaticook, Que.
Plans are being prepared by H. C. James, Sherbrooke, for a new edifice for the Methodist congregation. This building, which will replace the church recently destroyed by fire, will be built upon the old foundations.

Dubuc, Sask.
Wm. Anderson, secretary of the School Board, is receiving tenders for an addition to the school until April 16.

Erin, Ont.
Tenders wanted by G. T. Scott, secretary of the School Board, for a $30,000 building. Closing date for tenders, Apr. 25.

Ford, Ont.
Resolution passed for purchase of site for proposed school to cost about $100,000. Architect not yet appointed.

Glace Bay, N. S.
The congregation of the Roman Catholic Church plan a $45,000 edifice and hope to proceed with construction early in the fall.

Fredericton, N. B.
F. Neil Brodie, 42 Princess St., St. John, is preparing the plans for a memorial hall and laboratories for the University of New Brunswick. These buildings will cost about $125,000. Dr. C. C. Jones, chancellor.

Hamilton, Ont.
S. H. Kent, City Clerk, is receiving tenders on sewers until April 18.

Plans for a church seating 750 people and costing $40,000 being prepared for the congregation of Wentworth Avenue Baptist Church by J. F. Brown, 105 King St. East, Toronto.

Humberstone, Ont.
N. A. Kearns, Temple Bldg., Welland, has been appointed architect for the alterations to the school.

Maussville, Que.
Alterations to the college proposed by the Reverend Brothers Ste. Croix will cost about $40,000. Architect not yet appointed.

Oshawa, Ont.
Board of Education is receiving tenders for the proposed public school until Apr. 19. Hutton & Souter, Bank of Hamilton Bldg., Hamilton, architects.

Ottawa, Ont.
Tenders will be called shortly for roofing, plumbing, heating, electrical work and plastering for the $70,000 church for the Methodist Congregation.

Emmanuel Reformed Episcopal Church contemplates a new edifice. Rev. J. Robinson, interested.

Petrolia, Ont.
Plans for a gymnasium for the Methodist Church are being prepared. Joe Matthews is chairman of the committee.

Plessisville, Que.
Bergeron & LeMay, 103 St. John St., have prepared plans for a Town Hall costing $20,000. L. R. Guilbault, secretary.

Prince Albert, Sask.
Tenders for plastering and electrical contracts for the addition to the jail are being received by Poole Construction Co., Regina.

Richmond, Que.
A $50,000 School contemplated by the Catholic School Board. J. W. Gregoire, 16 Wellington St. South, Sherbrooke, architect.

St. Charles, Que.
Tenders for a $125,000 church are being received by S. R. Richer, architect, 240 Girouard St., Montreal, until April 15.

St. Fabrien, Que.
$5,000 Model School proposed by the Board. Emile Gagnon, secretary. No material purchased.

St. Francois Xavier, Que.
This parish proposes to complete the $100,000 church. This will include, plastering, ornamental doors, etc.

St. Michel des Saints, Que.
Contemplated church for the Roman Catholic Parish will cost $25,000. Architect not yet appointed. Rev. L. G. Melancon, curate.

Sarnia, Ont.
W. G. Murray, Dominion Savings Bldg., London, has prepared plans for a $25,000 Sunday School for the Anglican Church.

Sherbrooke, Que.
A $300,000 chool is contemplated by the Notre Dame Congregation. Rev. O. Martin, St. Vincent de Paul Hospital, interested.

Communante des Soeurs Grises, St. Vincent de Paul Hospital, contemplate a $600,000 addition to the hospital. J. W. Gregoire, 16 Wellington St. S., architect.

Smith's Falls, Ont.
Westminster Presbyterian Church, W. A. Woodside, chairman of the Building Committee, receiving tenders on a church until April 30. Cost of building estimated at $75,000.

Board of Education contemplates a $65,000 addition to a school. T. E. Foster, Property Commissioner. By-law will be submitted to the ratepayers shortly.

Tillsonburg, Ont.
Tenders for alterations to Tillsonburg Arena will probably be called about Apr. 15.

Wallaceburg, Ont.
Parish Hall contemplated by the Anglican Church. F. V. Vair, rector.

Westmount, Que.
Parish Hall costing $10,000 contemplated by Roman Catholic Parish. Leonard Cunningham, 198 Charlotte St., architect.

CONTRACTS AWARDED

Brampton, Ont.
Graham & Wedgewood, R.R. 6, Brampton, have the general contract for a hall costing $7,000 for the Peel County Agricultural Society.

Grande Linge, Que.
Bremner Norris & Co., 65 McGill College Ave., Montreal, have the general contract for a gymnasium and workchop for the Feller Institute costing $80,000.

Isle-Verte, Que.
Pierre Levesque, 115 St. John St., Quebec, reports contracts let on a $26,000 presbytery as follows: General contract, Filion & Labrecque, 142 de la Reine St., Quebec; plumbing, heating, electrical. O. Roberge, Ste. Marie.

Montreal, Que.
Contracts awarded by the Catholic School Commission for the $156,000 building are: Plumbing, heating, L. P. Ducharme & Cie, 2056 James St.; plastering, Degorgio Ltd., 12 Lagauchetere St.; painting and plazing, Bruno Novert, 1229 St. Dennis St.

Ottawa, Ont.
Contracts awarded for the Auditorium are: Brick and reinforced concrete, T. C. James, Flora St.; steel, Dominion Bridge Co., Carlton Chambers; electrical, Fred Wilson, 128 McLeod St.; plumbing and heating, McKinley & Northwood, 56 Rideau St.

Pembroke, Ont.
Estate of Walter Beatty, Pembroke, awarded the general contract for the Public School at $136,486.95.

St Leon de Stanson, Que.
Edgar Pellitier, 70 St. Cyrille St., Quebec, has the general contract for a church costing $48,500.

Tetreaultville, Que.
Contract for steel for a $55,000 presbytery and chapel awarded to Dominion Bridge Co., Lachine. T. Gauthier, 4 Mercier St., Montreal, general contractor.

Toronto, Ont.
Roofing contract for Humberside Collegiate awarded to E. Lankin & Son, 56 Lipincott St. at $5,562.

Board of Education has awarded the plumbing and heating contracts for a school to B. J. Miller & Co., 550 Bathurst St., at $24,355.

J. Boyce & Son, 21 Roylatt Ave., has the contract for plastering the addition to Gledhill School at $3,400.

The electrical contract for Jarvis St. Collegiate has been awarded by the Board of Education to Canada Electric Co., 175 King St. E., at $13,200.

Waterloo, Ont.
The Separate School Board has awarded contracts on the school as follows: Plumbing, Conrad Bros., 15 King St., North; heating, Battler & Trieberger, 209 King St., West, Kitchener.

Business Buildings and Industrial Plants

Albion Twp., Ont.
Charles Kearns, Bolton, P. O., is interested in the price of materials needed for rebuilding a stock barn.

Alexandria, Ont.
D. McDonald plans to re-build a theatre destroyed by fire as soon as possible.

Arnprior, Ont.
Plans are being prepared for stores and

apartments by Millson & Burgess, 209 Sparks St., Ottawa. Cost estimated at $15,000.

Brockville, Ont.
S. Crossitt, Court House Ave. & King St., is receiving tenders for a $15,000 office building. A. Stuart Allister, architect.

Carleton Place, Ont.
J. L. Kingston, Jackson Bldg., Ottawa, wants tenders on a theatre costing $18,000 for Johnson Bros.

Chicoutimi, Que.
Store and offices costing $20,000 being built by J. A. Guay. J. A. Lamintagne, architect.

Cochrane, Ont.
H. W. Bishop has prepared plans for stores for M. Roschilds which will cost about $15,000.

Cornwall, Ont.
Stores and apartments costing from $10,000 to $15,000 proposed by Mr. Cooperman who is receiving tenders and plans to begin work May 1.

Fredericton, N. B.
Purity Ice Cream Co. Ltd., Stanley St., will make a $5,000 addition to their plant this spring.

Hamilton, Ont.
Geo. Swanwick, Princess Theatre, 108 James St. N., plans to build a theatre costing $200,000.

Four stores and three apartments costing $25,000 under construction for D. McMillan, Barton Ave. MacKay Bros., St. Eloi Apts., builders.

Geo. Preston, general contractor, may build stores and apartments costing $13,000.

Canadian Westinghouse Co. Ltd., Aberdeen Ave., contemplates an addition to a factory. P. J. Myler, president.

Kitchener, Ont.
Tenders for a $9,000 store will be received by Ed. Reinhart, 122 Weber Ave., until April 14.

H. L. Jansen, Breslau, Ont., contemplates an addition to a business block at a cost of $50,000.

London, Ont.
Mrs. McIntosh, 458 Grey St., contemplates a Service Station.

Mimico, Ont.
W. J. Miller, 93 Yonge St., Toronto, is preparing plans for a $30,000 factory for W. E. Shenstone, London, Eng. All trades to be let.

Montreal, Que.
About May1, C. A. Reeves, architect, will call tenders on a store and residences costing $14,000, for Dr. Jeffery.

Foundations are in for a store and residence for L. Provost, 257 Gordon St., to cost about $7,500.

New Waterford, N. S.
Dominion Coal Co., Glace Bay, plans installing a new bank head costing $20,000.

Portneuf, Que.
Gauthire & Julien, Ltd., Portneuf Station are building a foundry costing $10,000. A. Gauthier buys all material.

Saskatoon, Sask.
Stores and suites costing $10,000 will be built by R. M. Scratch & Co., 342-2nd Ave S.

Sault Ste. Marie, Ont.
Store block costing $20,000 planned by Hinsperger & Harkness, 739 Queen St.

Sydney, N. S.
Tenders for a $350,000 hotel are being received by A. S. Burchell, 207 Charlotte St., until Apr. 24. Separate tenders are being received for plumbing and heating.

Tillsonburg, Ont.
Plans for a factory addition costing $15,000 drawn for Tillsonburg Shoe Co., and tenders will be called shortly. W. C. Caloff, Superintendent.

Toronto, Ont.
Milnes Coal Co. Ltd., 88 King St., are having plans for a branch on St. Clair Ave., prepared by D. H. Burnham, 260 Lauder Ave.

W. J. Baillie, 2095 Dufferin St., excavating for store and apartment costing $7,500. Owner is receiving tenders for all sub-trades.

J. A. Doige, 261 Ottawa St. N., Hamilton, will erect a plant for the manufacture of concrete blocks, sills, etc.

Tenders for a warehouse for Cassidy's Ltd., 51 St. Paul St. W., Montreal, will be received by MacVicar & Heriot 628 Union Ave., Montreal, until April 19.

Vancouver, B. C.
Store and apartment costing $8,000 being built by G. F. Adams, 1542 Beach St., for G. W. Dawson, Dawson Bldg., Hastings St., Vancouver.

J. Calson, 783 Keefer St., is building stores and suites for Mac. Juliana, 861 Pender St. E., at a cost of $11,000.

Willowdale, Ont.
Murray Brown, Confederation Life Bldg., Toronto, is preparing plans for a $20,000 office building.

CONTRACTS AWARDED

Kitchener,Ont.
L. Holle, King St., Waterloo has the general contract for alterations to a business block costing $12,000. Hamilton Bridge Works Co., Ltd., Bay St. North, Hamilton, has the contract for steel.

Quebec, Que.
The Gardner Clothing Co., 647 St. Valier St., is building a $14,000 addition to the factory and has awarder the general contract to L. H. Peters, 10 Ste. Angele St.

Sherbrooke, Que.
Newton Dakin Co., King St., west, have the general contract for a garage for Webster Motor Co., Wellington St., which will cost $20,000.

Stratford, Ont.
F. E. Ingram and Player Bros., have contracts for an addition, 60 ft. x 160 ft., to a store occupied by the Stratford Manufacturing Co.

Toronto, Ont.
The general contract for a service station for the Imperial Oil Co., 56 Church St. awarded to Archibald & Holmes, 709 Yonge St. Building will cost about $12,000.

Woodstock, N. B.
Work will commence at once on a $19,000 theatre. F. G. Spencer, 95 Charlotte St., St. John, owner; F. Neil Brodie, 42 Princess St., St. John, architect; Forbes & Brown, South Devon, York Co., general contractors. MacKinnon Steel Co. Ltd., Sherbrooke, have the contract for steel.

Residences

Hamilton, Ont.
Hutton & Souter, Bank of Hamilton Bldg., will prepare plans for a $20,000 dwelling.

Hutton & Souter, Bank of Hamilton Bldg., are preparing plans for a residence to cost about $30,000.

Kitchener, Ont.
Ten residences costing $50,000 will be built by Star Construction Co., 90 Cameron St., for O. N. Schiefele, 90 Cameron St.

London, Ont.
Geo. Parkinson will shortly commence excavating for a residence costing $6,000.

G. Nelson, 637 Dundas St., is receiving tenders on a $10,000 residence.

A. E. Wells, 516 Nelson St., wants tenders on a residence costing $7,000.

Longueuil, Que.
Semi-detached residence, costing $12,000 proposed by A. Millette, Longeuil. J. A. S. Houle, 55 St.Francois Xavier St., Montreal, architect.

Moncton, N. B.
$8,000 dwelling contemplated by Dr. J. Gaudet and work is expected to commence in June.

Montreal, Que.
L. Berthiaume, 1469 Parthenais St., has the foundations in for a residence costing $8,000.

Twelve residences, costing $7,500 each will be built by S. D. Vallierre, 370 Marlowe Ave. F. Deslauriers, 70 St. James St., general contractor.

Oshawa, Ont.
Dwelling costing $7,000 contemplated by J. V. Hill, 15 Simcoe St., north.

Ottawa, Ont.
Tenders on an $8,000 residence are being received by W. Douglas, 173 Daly Ave., until April 18.

L. F. Taylor, Fraser Building, Ottawa, is preparing plans for a $10,000 residence for J. P. Ashworth, Desoronto.

Plans are prepared for a $7,000 residence for W. W. Benny, 9 Euclid Ave.

Tenders for a duplex residence costing between $10,000 and $12,000 will be received by G. P. Armstrong, 610 Gladstone Ave., until Apr. 18.

Cornwall, Ont.
W. L. MacFarlane, 5th St., will shortly commence work on a residence costing between $7,000 and $8,000.

Quebec, Que.
Work is in progress on a $15,000 dwelling for Ferdinand Guillemette, 171 Bougainville Ave.

Regina, Sask.
W. P. Griffin, 1940 Hamilton St., will commence work on a $12,000 dwelling

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

COUNTY OF LINCOLN

COUNTY ROADS

Sealed tender, marked "Tender for Macadam Road" and addressed to Camby Wismer, County Clerk, St. Catharines, will be received until 6 o'clock P.M. on **Monday, April 16th, 1923**, for the construction of approximately three miles of Macadam Road.

A marked cheque for $2,000.00 must accompany each tender.

Plans, specifications and forms of tender may be obtained from the Engineer.

No tender necessarily accepted.

F. N. RUTHERFORD, County Engineer,
14-15 St. Catharines, Ont.

Township of Etobicoke

WATERWORKS AREA NO. 5

Sealed tenders plainly marked as to contents will be received by the Council of the Township of Etobicoke up to noon on **Monday, April 23rd, 1923**, for the supplying of materials and for the laying of mains.

1. **Cast Iron Pipes.**
2. **Hydrants and Valves.**
3. **Special Castings and Covers.**
4. **Laying of Mains.**

Plans and specifications may be seen and Forms of tender may be obtained on application to the undersigned.

The lowest or any tender will not necessarily be accepted.

The Council may divide the contents as they may deem expedient.

All envelopes must be plainly marked on the outside what tenders they contain, and they must be addressed to

R. O. WYNNE-ROBERTS & SON,
88 Church Street,
Toronto.

Telephone Main 2657.
April 12th. 15

Tenders Wanted

BOARD OF EDUCATION

Frankford, Ont.

Sealed tenders, separate or in bulk, addressed to J. M. Bell, Secy-Treas. Board of Education, Frankford, Ontario, endorsed with the name "Tender" will be received until **April 20th, 1923**, for the erection of a Public and Continuation School, containing eight rooms, community hall, etc.

Plans may be seen at the office of Mr. Simmons, Chairman, Frankford, at the office of Mr. Beaumont Jarvis, 8 Campbell St., Belleville, and at MacLean Building Reports, Toronto.

A marked cheque for 10% of the amount of the tender to accompany same.

A performance bond will be required for 40% of the amount of any contract.

The lowest or any tender will not necessarily be accepted.

J. M. BELL,
Secy. Public School Board,
Frankford, Ontario. 15

RATES

20 cents per agate line (14 lines to the inch) Positions Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

Tenders for Improvement of Road

Pursuant to the requirements of The Canada Highways Act, sealed tenders marked "Tenders for Project 1, Section C—sub-section D" will be received by the undersigned until twelve o'clock noon on

Wednesday, May 2nd, 1923,

for the excavation of approximately 43,000 cubic yards of earth and other work required in the construction of Provincial highway south from Elrose, 10 miles.

Copies of plans, profiles and specifications may be seen at the office of the undersigned, and at the office of each of the following parties:-

W. M. Grant, 105 Ross Block, Saskatoon, Sask.; J. R. Reid, Court House, Swift Current, Sask.; F. G. Kissack Dominion Grain Co., North Battleford, Sask.; G. E. Kinsman, Secy.-Treas. Village of Elrose, Sask.

An accepted cheque for the sum of $1,000.00 payable to the Deputy Minister of Highways, or a Guarantee Company's bid bond, must accompany each tender.

The right to reject any or all tenders or to waive any defects or irregularities therein is to be at the discretion of the Minister of Highways. Tenders will be opened in public in the office of the Deputy Minister at the hour of 4 p.m., Wednesday, May 2nd, 1923.

The unauthorized insertion of this advertisement will not be paid for.

H. S. CARPENTER,
Deputy Minister of Highways.
Department of Highways,
Regina, Sask., April 11th, 1923. 15

WANTED

Wheel Scrapers, State price, make, condition and location. Canadian Engineering & Contracting Co. Ltd., Room 42, Home Bank Building, 72 James Street North, Hamilton, Ont. 15

FOR SALE

No. 6 Gates Gyratory Crusher Type K with extra parts and in good running condition. Also 12 H.P. heavy duty gasoline engine. Both for immediate sale. Apply R. H. Miner Company, Ltd., 207 St. James Street, Montreal. 15-18

Tenders for Improvement of Road

Pursuant to the requirements of The Canada Highways Act, sealed tenders marked "Tenders for Project 2, Section F—Amazon to Watrous" Will be received by the undersigned until twelve o'clock noon on

Wednesday, May 2nd, 1923,

for the excavation of approximately 29,000 cubic yards of earth and other work required in the construction of Provincial highway from Amazon to Watrous.

Copies of plans, profiles and specifications may be seen at the office of the undersigned, and at the office of each of the following parties:-

W. M. Grant, 105 Ross Block, Saskatoon, Sask.; J. R. Reid, Court House, Swift Current, Sask.; F. G. Kissack Dominion Grain Co., North Battleford, Sask.; N. Bracewell, Town Clerk, Watrous, Sask.

An accepted cheque for the sum of $700.00 payable to the Deputy Minister of Highways, or a Guarantee Company's bid bond, must accompany each tender.

The right to reject any or all tenders or to waive any defects or irregularities therein is to be at the discretion of the Minister of Highways. Tenders will be opened in public in the office of the Deputy Minister at the hour of 4 p.m., Wednesday, May 2nd, 1923.

The unauthorized insertion of this advertisement will not be paid for.

H. S. CARPENTER,
Deputy Minister of Highways.
Department of Highways,
Regina, Sask., April 11th, 1923. 15

For Sale

1—½-yard Hayward Clamshell Bucket.
1—3 drum, 7 x 12 Robertson Hoist complete with boiler.
1—Dake Steam Swinger.
1—5 ton stiff leg Derrick, 70 ft. steel Boom (used three months.)
1—5 ton Kelly Springfield Tandem Steam Roller (just overhauled.)
Box 199, Contract Record, Toronto. 14-15

FOR SALE

Keystone Excavating Machine, complete with two sticks, skimmer scoop, and three ditching scoops; this machine has been used only one season and is guaranteed to be in first class condition. Price $4,500 f.o.b. St. John, N. B.

Austin Backfiller with caterpillar traction, 4-cylinder Buffalo engine, in equally good condition. Price $2,500 f.o.b. St. John, N. B. Canada Lock Joint Pipe Limited, 65 Pleasant Boulevard, Toronto, Ont.; or St. John, N. B. 8-T.f.

Notice to Contractors

Separate sealed tenders marked "Tender for Contract No. ......" will be received by the undersigned until 12 o'clock noon on **Monday, April 30th, 1923,** for the following work on the Provincial Highways.

Concrete Pavement

Contract No. 915 Dougal Ave. to Howard Ave., 1.75 miles.
" " 1000 Burlington Beach 4.4 miles.
" " 1002 St. Davids to Queenston 2.4 miles including grading (alternative).

Asphaltic Concrete Pavement

Contract No. 1009 Whitby to Oshawa 2.2 miles.

Bituminous Penetration Pavement

Contract No. 1001 From Holland River northerly to Road between Con. XI and XII Gwillimbury West, 5 miles.
" " 1002 St. Davids to Queenston including grading, 2.4 miles (alternative.)

Macadam Base

Contract No. 1003 Dunnville from East limits of Niagara St., easterly 5 miles including Grading.
" " 1004 Crofton Schoolhouse, Southerly to Bloomfield Bridge, 3.2 miles including Grading.

Grading

Contract No. 1005 Beachburg Easterly, 6 miles
" " 1006 Welcome corners to Dale, 2.5 miles.
" " 1008 Main St. via Filter beds to Hamilton City line 4.1 miles.

Bridge Abutments

Contract No. 1007 Dodds Creek Bridge—Lambeth.
" " 1010 Cayuga Bridge.

Plans, specifications, information to bidders, tender forms, and tender envelopes may be obtained on and after Wednesday, April 18th, 1923, at the office of the undersigned, or from the following Resident Engineers.

A. N. Fellowes, Hamilton,
Wm. M. Webb, Kingsville,
H. E. MacPherson, Barrie,
R. MacLennan, Cayuga,
W. F. Noonan, Napanee,
R. S. Smith, Renfrew,
D. W. Bews, Port Hope,
J. G. Smith, St. Thomas,
G. G. Greig, Waterdown.

A marked cheque for $1,000.00 payable to the Minister of Public Works and Highways, Ontario, or a Guaranty Company's bid bond for a similar amount must be attached to tenders for pavements, roadways, base course, and bridge construction, and on all other tenders the above conditions apply, but the amount of bond or cheque required is $500.00. A Guaranty Company's Contract Bond for 50 per cent. of the amount of the tender will be furnished by contractor when contract is signed. All bonds must be made out on Departmental forms.

The lowest or any tender not necessarily accepted.

W. A. McLEAN,
Deputy Minister of Highways.
Department of Public Highways, Ontario,
Toronto, April 9th, 1923. 15

Equipment for Sale

Complete equipment for rock quarrying and macadam road construction. Apply Box No. 217, Contract Record, Toronto. 15-T.f.

TENDERS

For the Construction of the Campbellford High School, Campbellford, Ontario

General tenders will be acceptable and must be on special forms and in sealed envelopes, which will be furnished for this purpose by the Architects.

A deposit of a marked cheque of 2½% of the amount of the contract or a Bid Bond is required with each tender, and when the contract is executed a bond of 50% of the contract will be required.

Tenders must be in the hands of the Architects on **April 23rd, 1923.**

A deposit of $25.00, is required by the Architects to procure plans. In the event of the plans not being returned on the date agreed, the said deposit will be forfeited.

Plans, specifications, tender forms and information may be had at the office of the Architect, S. B. COON & SON, 4 St. Thomas St., Toronto. 15

WANTED

Manager to take charge of painting and decorating department. Apply Henry Morgan & Co. Ltd., Factories, 139 Beaver Hall Hill, Montreal. 15-16

FOR SALE

Keystone Excavator, in good condition. A bargain. Box 202, Contract Record, Toronto. 14

Wanted to Hire

A fleet of Ford Ton Dump Trucks. Steady work for most of season. Box 216, Contract Record, Toronto. 15

WANTED TO PURCHASE

8 ton and 3 ton Asphalt Rollers, state make, condition and lowest cash price.

HAMILTON CONTRACTING CO. LTD.,
72 James St., North Hamilton, Ont. 15

For Sale

1 Keystone Excavator with extra Skimmer Scoop, ditcher bucket and sticks, in first class condition. Price complete $4200.00. Apply Box 215, Contract Record, Toronto. 15

FOR SALE

1—12 ton Waterous Road Roller.
1—16½ D Acme Jaw Crusher, size of opening 16" x 32".
1—Steel frame Elevator, 30 ft. long.
1—Revolving Screen 36" x 12'.
11—Jack Knife self dumping quarry cars 30" gauge.
About 2,000 ft. 20 pound rail.
1—Sawyer-Massey 20 H.P. Steam Tractor.

H. T. ROUTLY,
53 Yonge Street,
15 Toronto.

CONSTRUCTION SUPERINTENDENT with 15 years experience handling all classes of building and water work, wants position. A1 testimonial and guarantee results. Will go anywhere, Box 205, Contract Record, Toronto. 15-17

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Universal Equipment Company
Niagara Falls. 11-T-f.

Some One Wants to Buy

The equipment or machinery that you are not using.

It may be occupying valuable space in your yard or shop, collecting dust, rust and hard knocks.

Sell it before "Depreciation" scraps it.

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For Sale

In a good, live Western Ontario town, a Builders' Supply business, including an up-to-date plant for manufacturing cement block, field tile, sewer crock, fence posts, ornamental vases, etc.

A first class business in a first class locality, satisfactory reasons for selling. Apply Box 182, Contract Record, Toronto. 14-15

FOR SALE

STEEL PLATES—STRUCTURAL GRADE

1—58" x ⅜" x 8' 0" long
1—60" x ⅜" x 6' 6" "
1—60" x ⅜" x 9' 7" "
1—60" x ⅜" x 27' 0" "
1—72" x ⅜" x 8' 0" "
1—72" x ⅜" x 17' 0" "
1—48" x ⅝" x 20' 0" "
1—60" x ⅝" x 7' 9" "
1—60" x ⅝" x 32' 6" "
3—60" x ⅝" x 40' 0" "

The above List of Plates weighs about 15 tons.

This is New Stock, although rust colored from lying in our Stockyard.

In addition we have some Narrow Plates, and a quantity of Angles, Tees, Zees and Bars. Send for a complete List and Price if you are interested.

Mill deliveries are slow; here is an opportunity to secure steel quickly.

THE MARITIME BRIDGE CO. LTD.,
15 New Glasgow, N.S.

A Service to the Profession

Every man wishing to tender must first see the plans and specifications.

If the plans are in Montreal and he is in Vancouver the inspection is a problem. We, however, with your assistance, are able to solve it. Place them on file at any or all of the offices of the "Contract Record" throughout the Dominion.

Contractors, engineers and allied manufacturers read the "Contract Record." It is the logical publicity medium for the announcement of tenders wanted.

Send us your plans. They will receive the best of care.

A room is reserved in each of our offices for examination of your plans by possible bidders.

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Toronto - - - 345 Adelaide St., W.
Montreal - - 119 Board of Trade Bldg.
Winnipeg - - - 302 Travellers' Bdg.
Vancouver - - - 106 Winch Bldg.

for A. E. McGall, 2059 Smith St., Regina

Shawinigan Falls, Que.

Dwelling costing $10,000 contemplated by Wm. Frigon, 127-3rd St. Construction will commence in May.

Terrebonne, Que.

Nine flats planned by L. M. Jardins. C. A. Reeves, 83 Craig St., Montreal, architect. Tenders will be called in May.

Toronto, Ont.

J. M. Jeffery, Confederation Life Bldg., is preparing plans for a $10,000 residence for P. E. F. Smily, Bank of Hamilton Bldg. Architect will call tenders.

G. W. Ormerod, 55 Westlake Ave., contemplates eleven residences costing $5,000 each. W. G. Hunt, Conferedation Life Bldg., architect.

R. H. Arnold, 117 Medland St., is excavating for a residence costing $10,000.

H. L. Grimshaw, 1176 Danforth Ave., is excavating for residences on St. Leonards Ave., which will cost $11,000 each.

S. B. Green, 41 Austin Terrace, has started work on five houses costing $12,000 each and contemplates eight more.

In addition to residences under construction, S. B. Green, 41 Austin Terrace, plans 17 residences costing $20,000 each. Building will commence in about a month.

Plans are being prepared for fourteen duplex residences costing $50,000 by H. Marin, architect, 36 Colborne St., Toronto Housing Co. are the owners.

Cotnracts for roofing, plastering, painting, wiring, plumping and heating for a $12,000 residence to be let by A. R. Burk, 18 Toronto St., general contractor.

A $20,000 residence to be built by A. R. Burk, 18 Toronto St., general contractor. Tenders on all trades will be called shortly.

$12,000 dwelling will be built by A. R. Burk Co., 18 Toronto St., general contractors. Tenders will be called shortly.

Vancouver, B. C.

Thos. Turnel, Main St., Vancouver, has excavated for a residence costing $6,000.

Windsor, Ont.

An eight family apartment costing $35,000 under construction by Abbott & Gray, 207 Gladstone Ave.

Peter Osterhout, Exchange Building, has ercavated for a $7,000 duplex residence.

Roy Abry, c/o Peter Osterhout, Exchange Bldg., is building a duplex residence costing $7,000

L. J. LaFontaine, 341 Pitt St. E., has excavated for a duplex residence costing $7,000. Peter Osterhout, Exchange Bldg., general contractor.

CONTRACTS AWARDED

Monteal, Que.

J. Gody, 2730 Drolet St., has the general contract for an apartment house for X. B. Deseve, 334 St. Joseph Blvd.

Toronto, Ont.

The contracts for a residence and garage, costing $10,000, for Atwell Fleming, 54 Elm St., awarded as follows: Masonry, Gordon Bros., 6 Delisle Ave.; roofing and sheet metal work, Ball & Baker, 866 Palmerston Ave; plumbing and heating to be let by Molesworth, West & Secord, architects.

Jack & Awde, 232 Armadale Ave., have the general contract for a $15,000 residence and garage for W. R. Willard. Sub-trades to be let.

Power Plants Electricity and Telephones

Casselman, Ont.

J. N. Coupal contemplates remodeling an electric plant. Will require turbines. Work will probably proceed in June.

Paugan Falls, Que.

Plans are being drawn for the Hull Electric Co., 117 Main St., Hull, for a dam 125 feet high. G. G. Gale, vice-president.

St. Michel des Saints, Que.

L. J. Menard contemplates installing an electric system in a saw mill and wants prices on turbines and generator for about 1,500 lamps.

Miscellaneous

Glace Bay, N. S.

Locomotive boilers, costing $6,000, contemplated by the Dominion Coal Co., Glace Bay. D. Hine, c/o Steel Co., Sydney, purchasing agent.

Levis, Que.

Steel tanks costing $50,000 contemplated by the city. Edouad Hamel, St. Peter St., engineer.

London, Ont.

Central heating plant contemplated by John Hayman & Sons, 432 Wellington St., who are receiving estimates on this work.

Midale, Sask.

New heating system costing $2,000 contemplated by this school district. Address, secretary, Midale.

Montreal, Que.

Letters patent have been issued incorporating James Laurin, William C. Leitch, contractors both of Westmount and Emile Laurin, engineer, Montreal, for the purpose of carrying on business as engineers and general contractors. The Company will be known as Laurin, Leitch & Co. Capital $50,000. Head office, Montreal.

On or about May 15, J. A. Major & Co. Ltd., wrecking contractors, will move their offices from 16 St. James St., to 308 St. Nicholas Bldg.

Thos Webster, plumbing contractor, has moved from 78 Wellington St., to 187 McGill St.,

Niagara Falls Ont.

T. S. Scott is receiving tenders for the City of Niagara Falls for a supply of paving asphalt and fuel oil.

Oshawa, Ont.

Town Council proposes a steel water tower costing $50,000, plans are drawn but not yet approved. W. C. Smith, engineer.

Ottawa, Ont.

Tenders for plumbing and heating apartments at a cost of $2,000 are being received by T. J. McLaughlin, 317 Frank St.

Port Colborne, Ont.

Port Colborne Foundry Co. will call tenders for the installation of a 7 ton travelling crane. O. Alair, secretary.

Toronto, Ont.

Kenilworth Building Co. Ltd., 238 Har-

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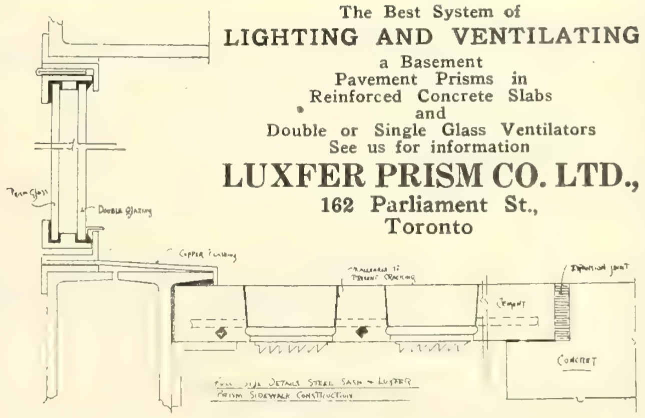
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Write for folder 606 and invite their co-operation.

B. F. Sturtevant Company
of Canada, Limited
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Sturtevant
PUTS AIR TO WORK

land-Smith Bldg., Bay & Adelaide Sts., builders and contractors recently incorporater with a capital of $40,000 to take over the business of A. E. [illegible] & Co.

Late News

Assiniboia, Sask.
Tenders for roadwork from Assiniboia to Limerick will be received by the Deputy Minister of Highways until April 25.

Blind River, Ont.
Contemplated repairs to a wharf to be made by the Dominion Government will cost $21,000. This is allowed for in the estimates for this year.

Goderich, Ont.
Dominion Government contemplates improvements to the harbor costing $11,800. R. C. Desrochers, Ottawa, secretary.

Guelph, Ont.
Notice is given in the Ontario Gazette that the Albert W. Smith Company, Ltd., will henceforth be known as the Guelph Plumbing and Heating Co. Ltd.

Kerrobert, Sask.
The Provincial Government is receiving tenders for a highway south from Kerrobert, 22 miles. Tenders close April 25. C. H. S. Carpenter, Deputy Minister of Highways.

Montreal, Que.
Alfred Poitvin, 26 St. James St., architect, is receiving tenders on all trades for three flats costing $24,000.

Point au Trembles, Que.
$12,200 allowed in the 1923 estimates by the Dominion Government for contemplated repairs to the wharf.

Regina, Sask.
R. Putz, 1417-11th Ave., Regina, will shortly build a store and residence costing $15,000.

Rimouski, Que.
Reconstruction of a wharf contemplated by the Dominion Government at a cost of $20,000 and this item has been included in the estiatmees for 1923.

St. Michel de Bellechasse, Que.
Dominion Government contemplates repairs to the wharf at a cost of $16,000.

Saskatoon, Sask.
Storm sewer costing $8,000 to be built by the city. G. B. Archibald, Saskatoon, engineer.

Toronto, Ont.
A. R. Burk & Co., 18 Toronto St., are excavating for a residence costing $20,000.

W. R. Worthington Contracting Co. have recently incorporated to carry on business as engineers and general contractors.

Standard Builders Limited, recently incorporated with capital of $40,000 will operate as builders, wreckers, contractors, architects and engineers.

Winnipeg, Man.
City of Winnipeg is receiving tenders on cast iron water pipe and valves until April 16. C. J. Brown, City Hall, clerk

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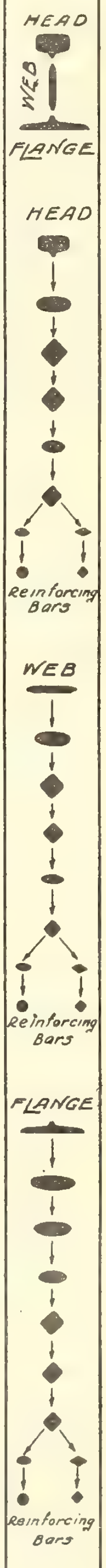

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Current Prices of Building and Engineering Materials

CEMENT (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Retail lots including bags	per bbl.	$4.60	$4.16	$4.80	$3.70
Car lots, including bags	per bbl.	3.60	3.48	4.20	3.35
Refund on bags	each	.20	.20	.20	

LIME (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Lump, in retail lots	per ton	14.30	14.00	.58 bu.	2.70 bbl
Lump, in car lots	per ton	12.70**	11.00	13.80 ton*	2.60 bbl
Hydrated, in retail lots	per ton	20.00	26.00	.63 bag*	30.00
Hydrated, in car lots	per ton	19.00	21.00	.56 bag*†	25.00

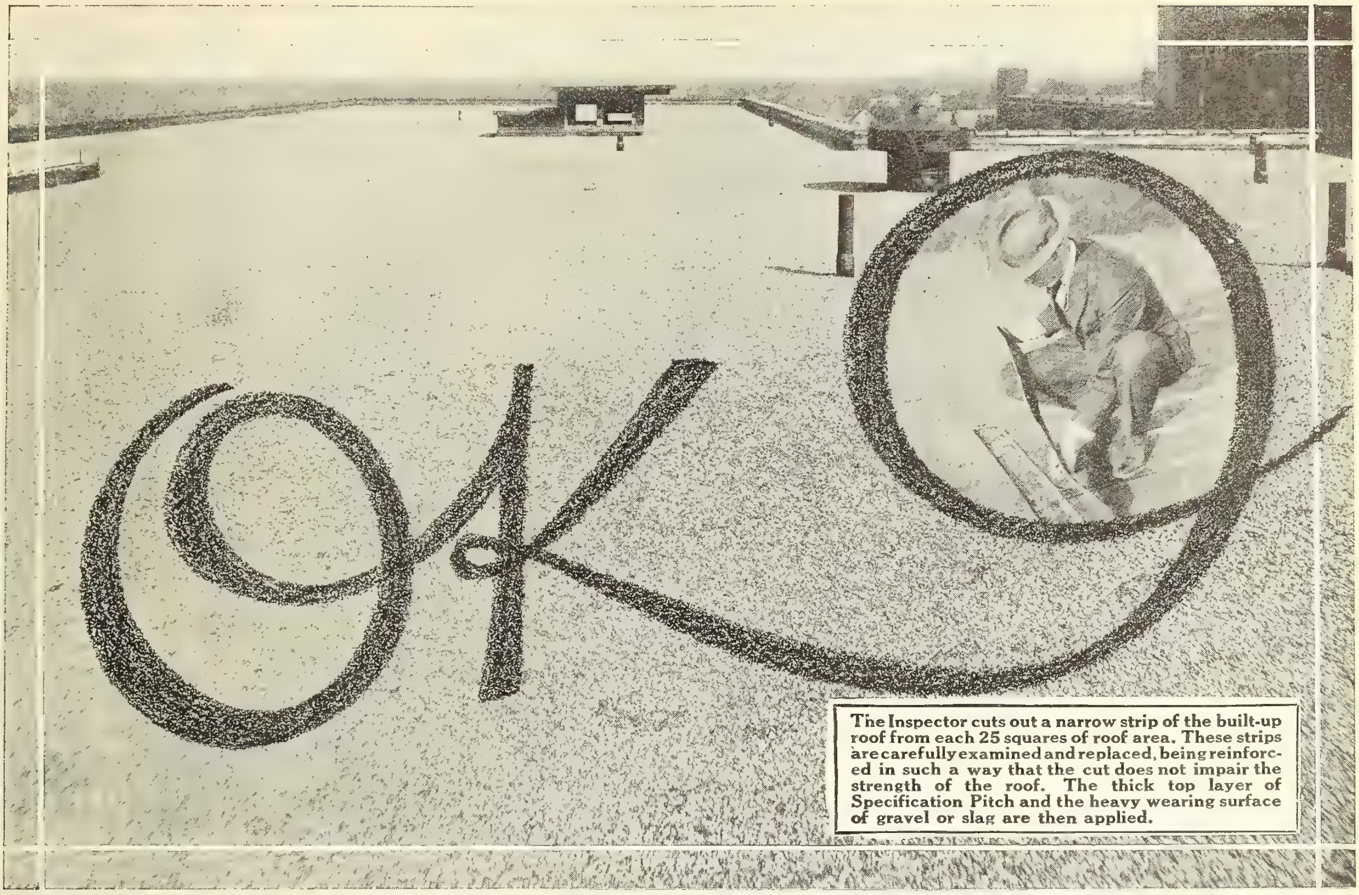
BRICK and TILE (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Common face brick	per M.	24.00	16.50*	19.00	30.00
No. 1 dry pressed brick	per M.	31.00	30.00	36.00	70.00
No. 2 dry pressed brick	per M.	29.00	25.00	32.00	
Enamelled brick	per M.	125 up to	230.00	185.00	150.00
Wire cut brick, for foundation work	per M.	21.00	19.00		50.00
Sand lime brick	per M	17.00		18.00	
Hollow building tile	per M.			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	60-95	60-75	85-100	80.00
Fire clay	per ton	13-20	15-16.00	35.00**	22.00

STONE, SAND and GRAVEL (f.o.b. cars on siding):—		Toronto	Montreal	Winnipeg	Vancouver
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.00 yd
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 "	" "
Crusher run	per ton	2.20½		3.00 "	" "
Rubble stone	per ton	2.45	1.70	15.00 cord	" "
Gravel, 2 in. screened	per ton	2.05		2.45 yd.	" "
Gravel 1 in. screened	per ton	2.31	1.50	2.75 "	" "
Sand, screened	per ton	1.42½	1.25	1.90 "	" "
Pit run	per ton	1.52¾	1.25	1.90 "	" "

STEEL and IRON (f.o.b. warehouse):—		Toronto	Montreal	Winnipeg	Vancouver
Mild steel bars, ¼ in. and heavier	per 100 lbs.	3.75 base	3.50 base	4.60	4.00
Bands 3/16 in. and lighter	per 100 lbs.	4.25 "	3.50 "	5.10 base	
Hoops	per 100 lbs.	5.00 "	4.50 "		
Twisted and deformed bars	per 100 lbs.	3.75 "	3.50 "	4.55	4.00
Angles, channels and tees under 3 in.	per 100 lbs.	3.90 "	3.75 "	5.35	6.00
Structural shapes	per 100 lbs.	4.00 "	3.75 "	5.05 base	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.40 "	3.75 "	5.15	6.25
Plates—3/16 in.	per 100 lbs.	3.60 "	4.10 "	5.55	6.50
Plates—10 gauge	per 100 lbs.	4.40 "	4.50 "	5.45	6.50
Black sheets—28 gauge	per 100 lbs.	5.50 "	5.00 "	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.90	7.00	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	6.65 "	7.00 "	7.70	8.25-8.50
Rivets	per 100 lbs.	6.25 "	6.00 "	7.00 base	
Cast iron pipe	per ton	65.00	60.00		

VITRIFIED CLAY PRODUCTS (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Sewer pipe, 4 in.	per ft.	.40	.30	.35	.28
Sewer pipe, 6 in	per ft.	.60	.45	.45	.48
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.55
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.70
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.85
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00	.90	.65	.75
Chimney tops	each	9.00	3.50–5.00	7.50	4.50–6.00
Discounts		45 % truck lots	20 %		
		50 % car lots	50 %	5 %	

CEMENT:—*Discount of 10 cts. per bbl. in 20 days. Price f.o.b. cars is $3.75 †Subject to 5% discount. **Excluding bags.
LIME:—*Discount of 5%. †Bag of 50 lbs. **Price f.o.b. cars is $11.70.
BRICK AND TILE—*f.o.b. plant.
STONE SAND AND GRAVEL:—*Winnipeg prices subject to 5% disco **Toronto prices include sales tax.



The Inspector cuts out a narrow strip of the built-up roof from each 25 squares of roof area. These strips are carefully examined and replaced, being reinforced in such a way that the cut does not impair the strength of the roof. The thick top layer of Specification Pitch and the heavy wearing surface of gravel or slag are then applied.

The job is not done until the Inspector's O.K. is on the Barrett Specification Roof—

Not until the finished Barrett Specification Bonded Roof is approved by a Barrett Inspector, is the roofer's contract with the owner completed. For the Surety Company Bond which guarantees the roof against repair and maintenance expense is issued only on the Inspector's O. K.

And not until the Inspector is sure that the roof conforms strictly to The Barrett Specification—not until he is sure that the required number of layers of Specification Felt and Specification Pitch were used, and properly used—does he approve the job.

He bases his approval upon his own careful observations while the roof was under construction, and as a final and absolute check on both the materials and the workmanship he makes the famous "cut-out test" just before the wearing surface of gravel or slag is applied. This test is shown and described in the picture above.

The Barrett Inspector takes no chances, for the roof must remain staunch and tight during all the years of the bonded period.

The Barrett Bond Guarantee is therefore even more than a readily enforceable pledge of "no roof repairs." It is proof positive that the roof was properly constructed of the highest grade materials. And after all this is the best insurance of long uninterrupted roof service.

There are two types of Barrett Specification Bonded Roofs—Type "AA", bonded for 20 years, and Type "A", bonded for 10 years. Both are built of the same high-grade materials, the only difference being in the quantity used. We will gladly send, on request to our nearest office, full information regarding these bonded roofs and copies of the Barrett Specifications.

The Barrett Company
LIMITED
MONTREAL TORONTO ST. JOHN, N.B.
WINNIPEG VANCOUVER HALIFAX, N.S.

Barrett Specification Roofs

Bonded for
20 and 10
Years

CURRENT PRICES OF BUILDING AND ENGINEERING MATERIALS—continued

Lumber (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver*
Flooring, 1 x 3 and 4 in., clear, E. G. fir	per M.	90,00	60.00	94.50	55.00
Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	70.00	65.00	63.00	30.00
Flooring, No. 1 pine	per M.	70.00	80.00	64.80	
Flooring, No. 1 Spruce	per M.	48.00	45.00	40.50	
Flooring, birch and maple, 13/16 in. clear	per M.	130.00	110.00	171.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	130.00	125.00	157.50	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	70.00	65.00	63.00	30.00
V joint, No. 1 pine	per M.	70.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	43–58	45.00	67.50	
Red and Jack Pine, 2 x 4 to 12 in., com. rough	per M.	44/58	70.00	40.50	
Hemlock, 2 x 4 to 12 in.	per M.	42/45	40.00	42.50	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	40–50.00	50.00	38.70	11.00-13.50
Spruce, 1 and 2 x 4 to 12 in.	per M.	44/58	45-35	38.70	
Timbers, fir, 10 x 10 in. and up	per M.	65.00	58.00	55.00 base	17.-22.00
Lath, No. 1 white pine	per M.	16.00	12.00	12.60	
Lath, M. R. spruce	per M.	10.00	8.50	11.25	7.00
Shingles, XXX B.C. cedar	per M.	6.50	5.00	6.30	3.40
XX B.C. cedar	per M.	4.50	4.25	4.50	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	115.00	55.00
Fir casing	per M.	1 ct. per in.	100.00	115.00	
PAINTS, OILS, COLOURS (delivered):—					
White lead ground in oil, less than ton lots	per cwt.	14.55	13.75	15.60	15.80
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	22.00
Putty in bulk	per cwt.	5.95	4.25	5.50	9.25
Steel sash putty in bulk	per cwt.	6.45	6.00	8.00	7.75
Boiled linseed oil, in bbls.	per gal.	1.28	1.18	1.26	1.28
Raw linseed oil, in bbls.	per gal.	1.25	1.15	1.23	1.25
Turpentine, in bbls.	per gal.	2.25	2.00	2.50	1.60
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 9/10	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 4/5	.45
PLASTER (Delivered):—					
Hard wall plaster, sanded	per ton	13.50	15.00	25.40	30.00
Plaster of paris, in bbl. lots	per bbl.	6.00	5.35	1.60 bag*	7.50
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu.	1.50
LABOR:—					
Bricklayers	per hr.	1.00	.80–.90	1.15	1.06¼
Structural Iron Workers	per hr.	.85	.50–.75	1.25	1.00
Plasterers	per hr.	1.00	.80	1.05	1.06¼
Hoisting Engineers	per hr.	.70–.80	.50	.90–1.10	1.00
Plumbers	per hr.	.90	.60–.75	1.00	.90
Carpenters	per hr.	.80	.65	.90	.81¼
Painters	per hr.	.75	.55–.65	.80	.81¼
Electrical Workers	per hr.	.80	.65	.70– .90	1.00
Roofers	per hr.	.65	.65		.90
Laborers	per hr.	.40–.50	.30	47½–.55	.50–.56¼
Sheet Metal Workers	per hr.	.75			.90

LUMBER:—*Owing to the general unstable condition of the present lumber market, Vancouver dealers refuse to quote any prices at all especially for Prairie or Eastern publication. The prices are, moreover, fluctuating from day to day. Such prices as we quote are, therefore, averages and not standard.

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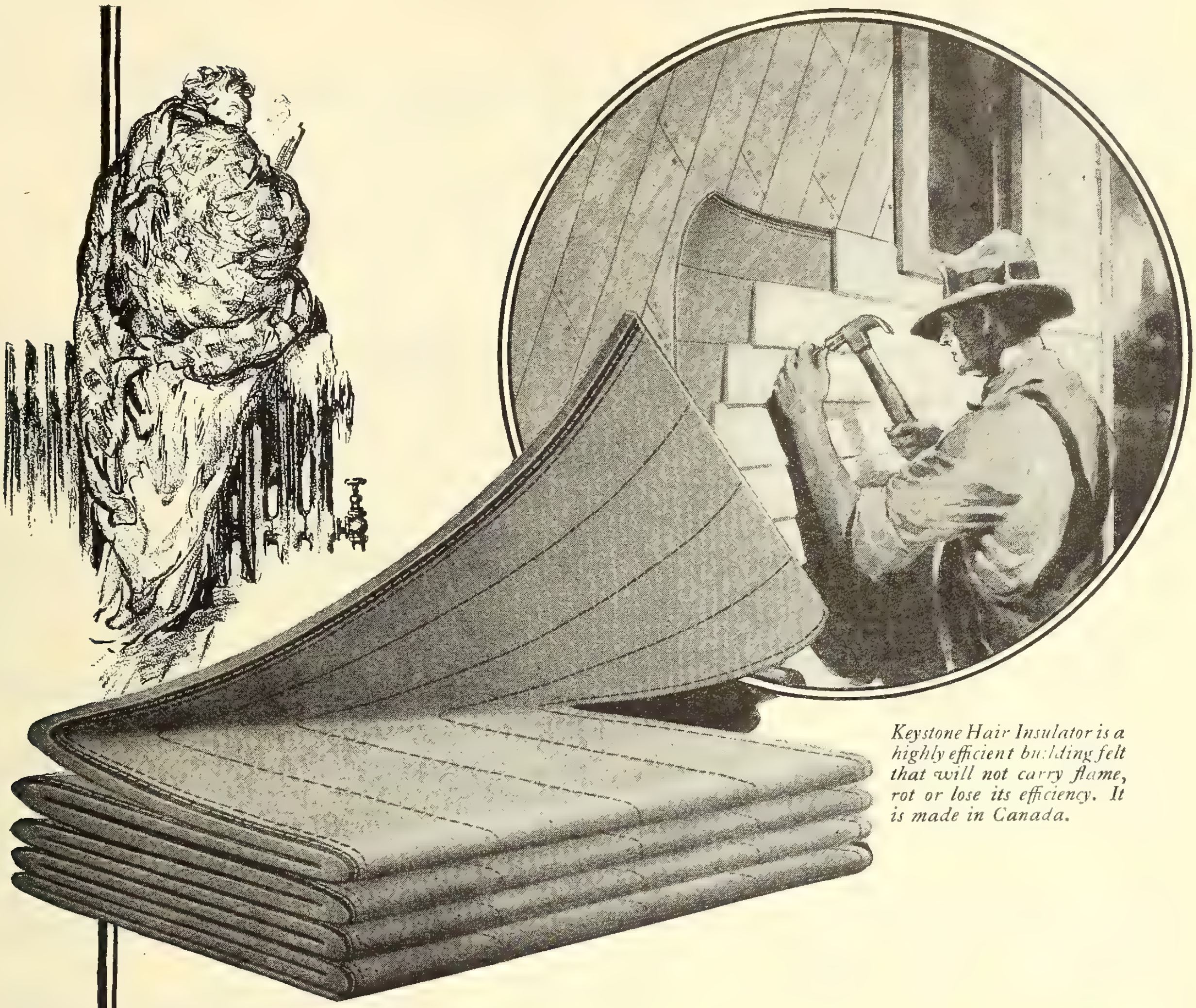

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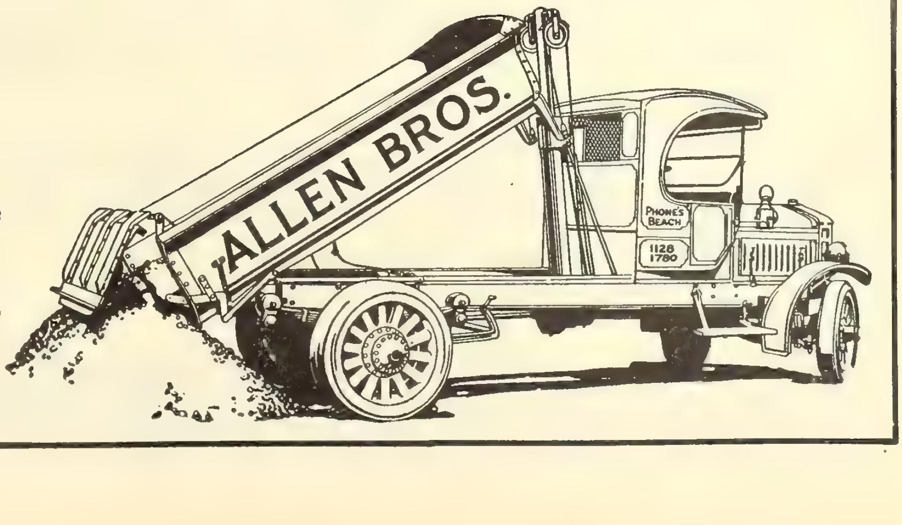

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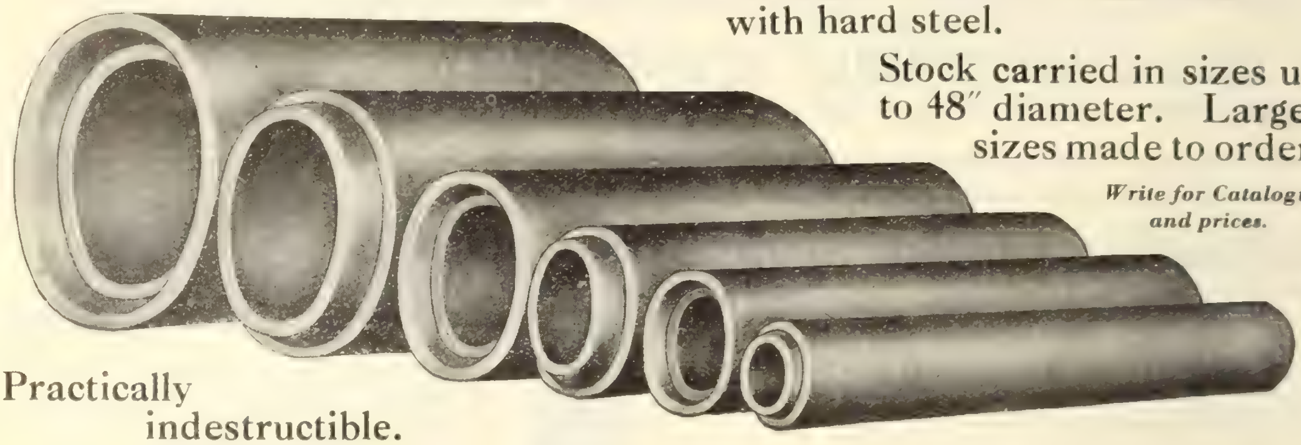

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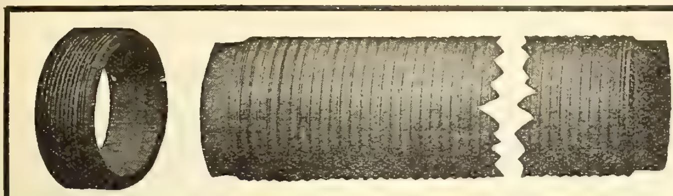

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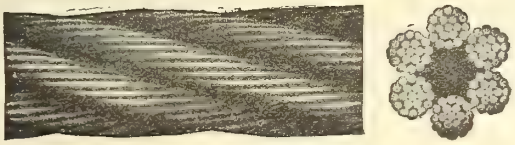

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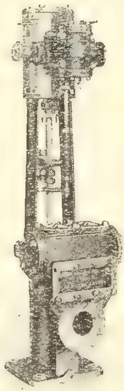

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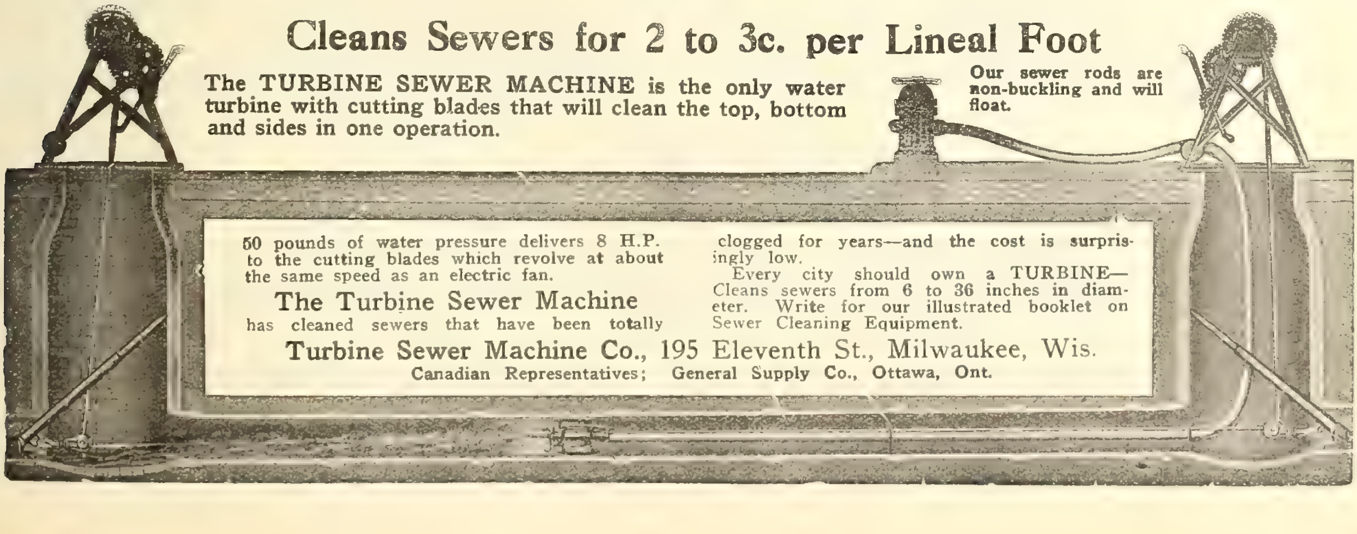
Cleans Sewers for 2 to 3c. per Lineal Foot

The TURBINE SEWER MACHINE is the only water turbine with cutting blades that will clean the top, bottom and sides in one operation.

Our sewer rods are non-buckling and will float.



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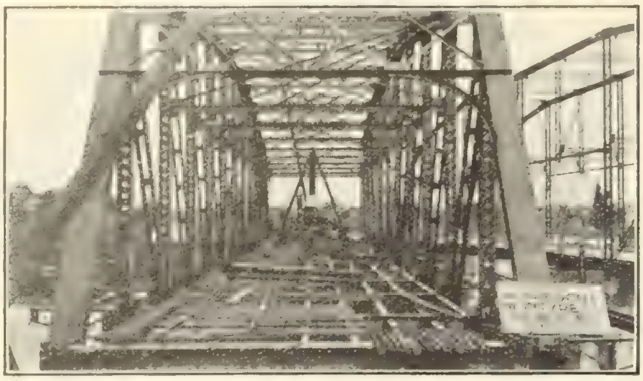
Structural Steel AND Bridges



192′ 0″ Clear Span Highway Bridge over Thames River, North Richmond St., London, Ont. Erected 1922

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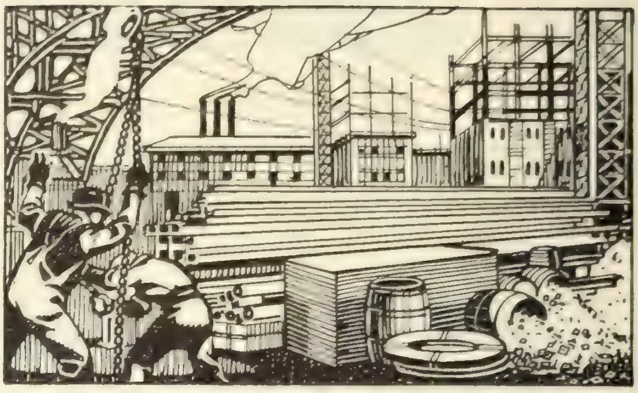

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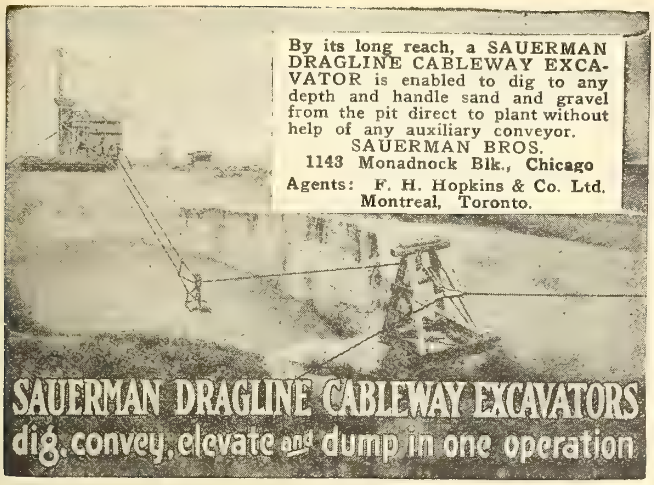
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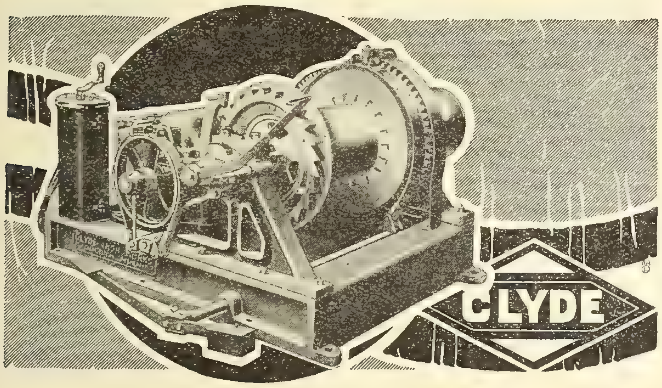

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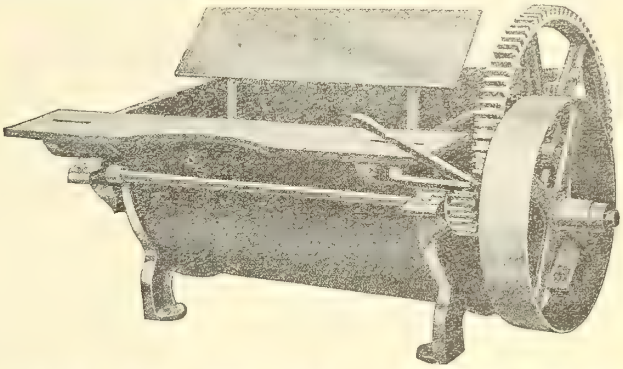

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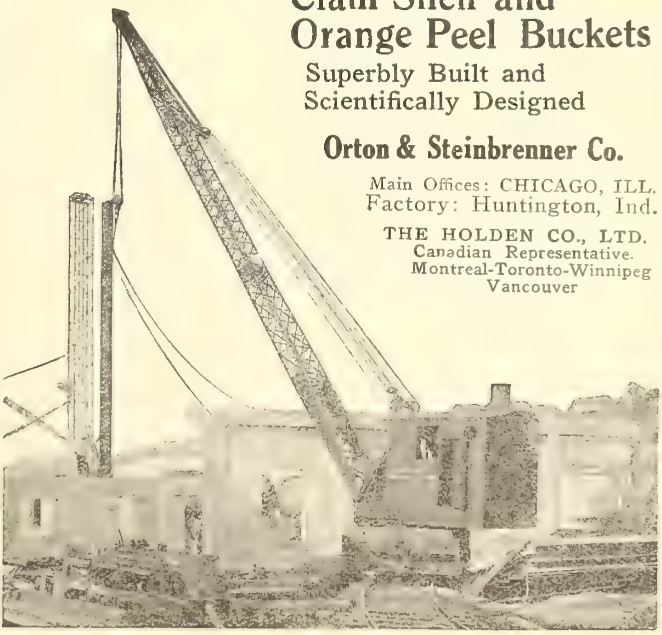

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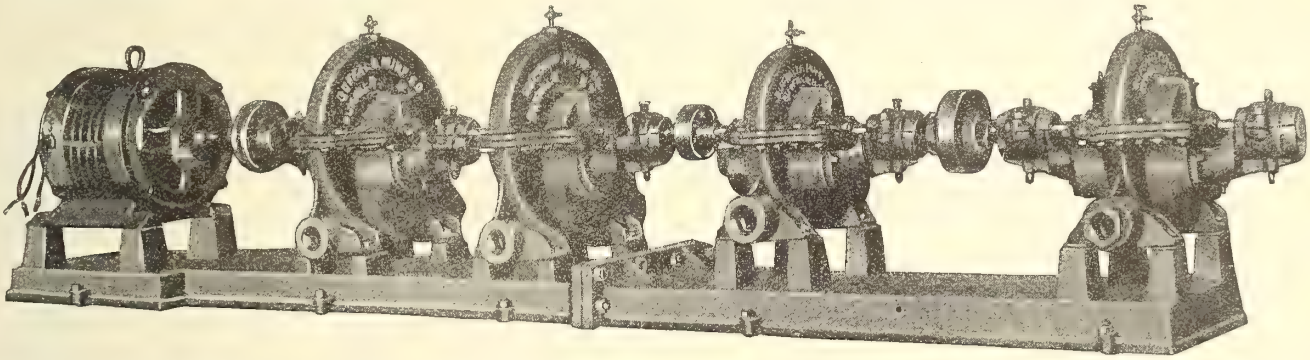

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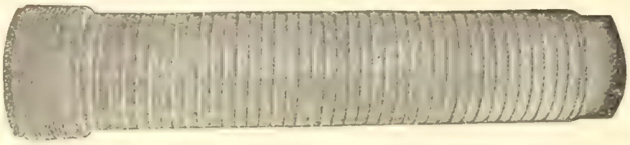

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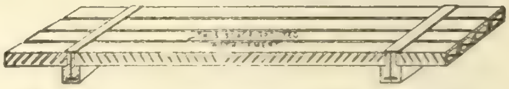

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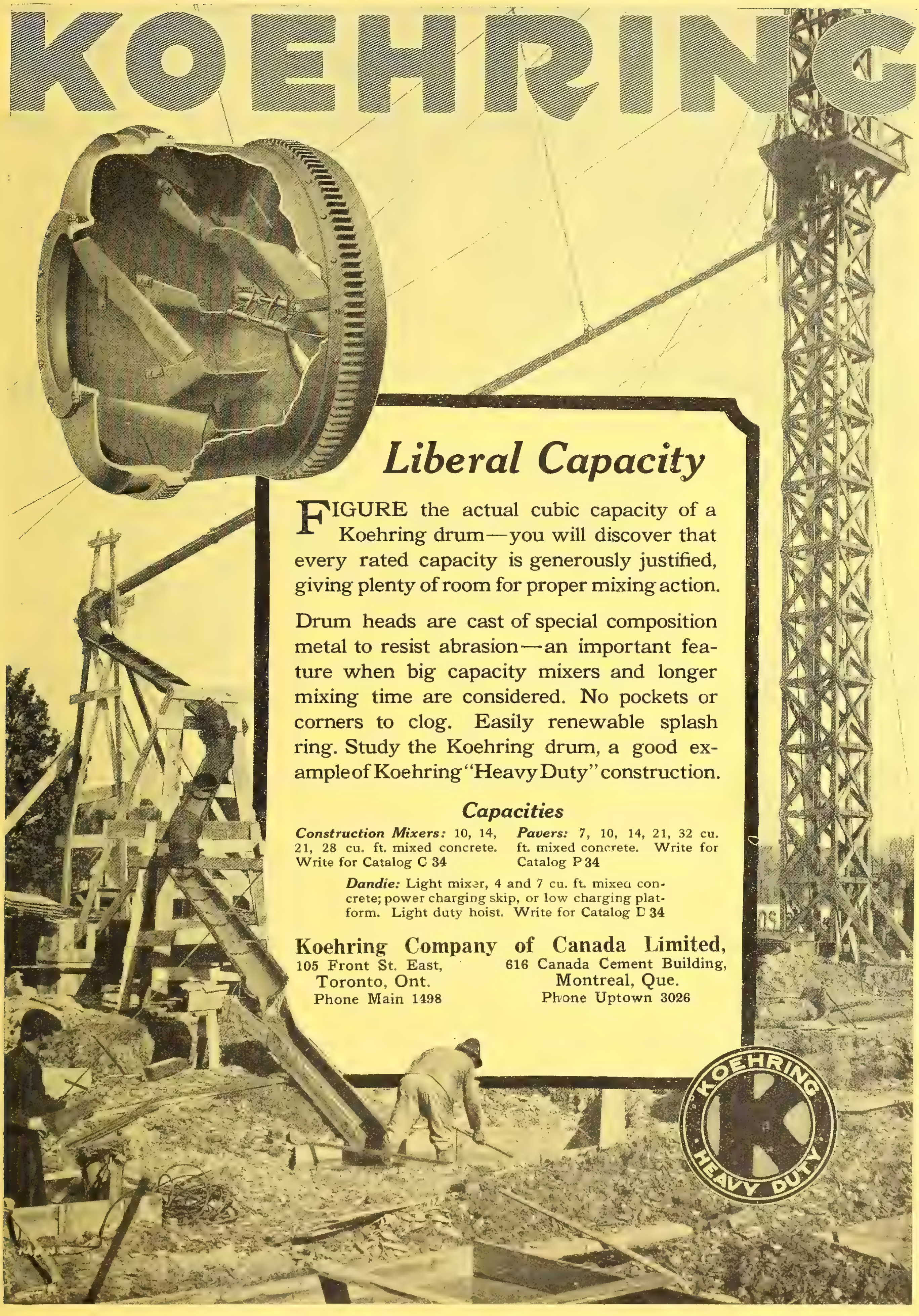

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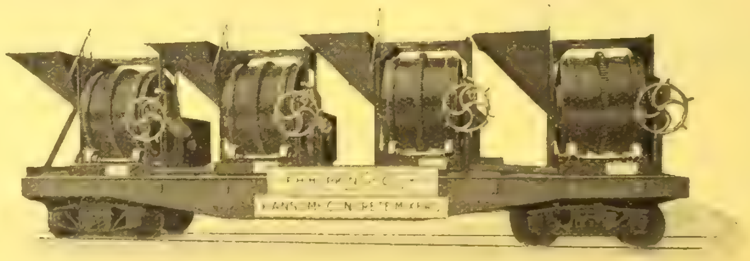

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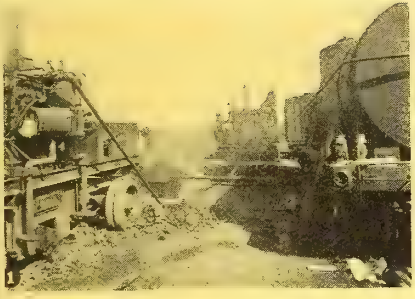

1. *Heating two 6,000 gal. tank cars simultaneously and loading distributor with Asphalt.*
2. *Spraying the wearing course, (1½ gals. per sq. yd.) using offset bar to prevent rutting.*
3. *Spraying the seal coat (½ gal. per sq. yd.) after keying wearing course with 1″ stone.*
4. *Completed work (showing surplus of chips.)*

Asphalt—

Hamilton to Guelph

Considerable progress was made last year on another of the important Provincial Highways leading out of that city. Our illustrations show views of the Hamilton to Guelph highway where Penetration Asphalt Macadam was laid on that section known as Contract 619, between Black's Corners and Clapison's Corners.

The Penetration Asphalt Macadam was laid over a broken stone foundation previously prepared and consolidated. The surfacing stone was all laid by the Provincial Contracting Company, Limited, while the spraying of the Asphalt was efficiently and expeditiously done by the Bituminous Spraying and Contracting Company, Limited.

All the Asphalt used in this work was Imperial Asphalt and it is interesting to note that because of the very heavy traffic this road will likely carry, it was deemed advisable to use an Asphalt Binder much harder than ordinarily used for this type of construction. Although this necessitated spraying at a much higher temperature than usual, very satisfactory results were obtained.

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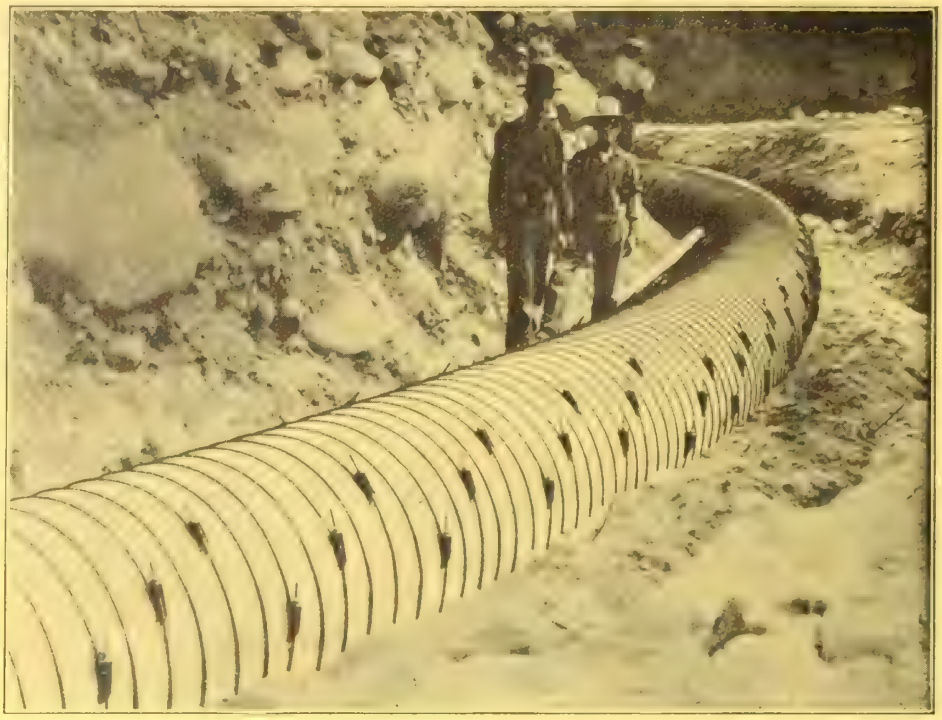
Alphabetical Index to Advertisers Page 16 Classified Directory to Advertisements Page 6



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From THE DETROIT LEGAL NEWS, WEDNESDAY, MARCH 21, 1923

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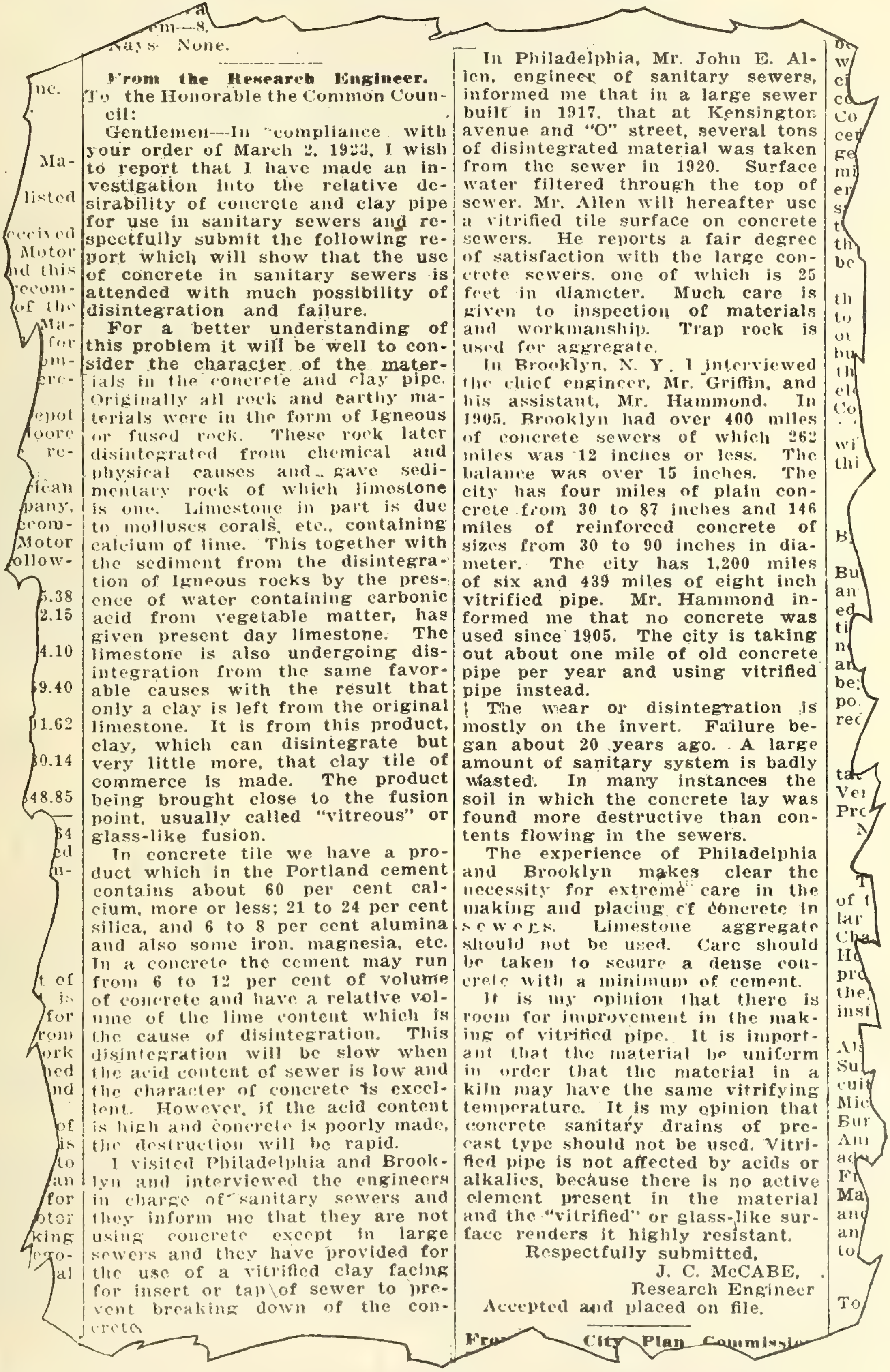

em—8.
Nays None.

From the Research Engineer.

To the Honorable the Common Council:

Gentlemen—In compliance with your order of March 2, 1923, I wish to report that I have made an investigation into the relative desirability of concrete and clay pipe for use in sanitary sewers and respectfully submit the following report which will show that the use of concrete in sanitary sewers is attended with much possibility of disintegration and failure.

For a better understanding of this problem it will be well to consider the character of the materials in the concrete and clay pipe. Originally all rock and earthy materials were in the form of Igneous or fused rock. These rock later disintegrated from chemical and physical causes and gave sedimentary rock of which limestone is one. Limestone in part is due to molluses corals, etc., containing calcium of lime. This together with the sediment from the disintegration of Igneous rocks by the presence of water containing carbonic acid from vegetable matter, has given present day limestone. The limestone is also undergoing disintegration from the same favorable causes with the result that only a clay is left from the original limestone. It is from this product, clay, which can disintegrate but very little more, that clay tile of commerce is made. The product being brought close to the fusion point, usually called "vitreous" or glass-like fusion.

In concrete tile we have a product which in the Portland cement contains about 60 per cent calcium, more or less; 21 to 24 per cent silica, and 6 to 8 per cent alumina and also some iron, magnesia, etc. In a concrete the cement may run from 6 to 12 per cent of volume of concrete and have a relative volume of the lime content which is the cause of disintegration. This disintegration will be slow when the acid content of sewer is low and the character of concrete is excellent. However, if the acid content is high and concrete is poorly made, the destruction will be rapid.

I visited Philadelphia and Brooklyn and interviewed the engineers in charge of sanitary sewers and they inform me that they are not using concrete except in large sewers and they have provided for the use of a vitrified clay facing for insert or tap\of sewer to prevent breaking down of the concrete.

In Philadelphia, Mr. John E. Allen, engineer of sanitary sewers, informed me that in a large sewer built in 1917, that at Kensington avenue and "O" street, several tons of disintegrated material was taken from the sewer in 1920. Surface water filtered through the top of sewer. Mr. Allen will hereafter use a vitrified tile surface on concrete sewers. He reports a fair degree of satisfaction with the large concrete sewers, one of which is 25 feet in diameter. Much care is given to inspection of materials and workmanship. Trap rock is used for aggregate.

In Brooklyn, N. Y., I interviewed the chief engineer, Mr. Griffin, and his assistant, Mr. Hammond. In 1905, Brooklyn had over 400 miles of concrete sewers of which 262 miles was 12 inches or less. The balance was over 15 inches. The city has four miles of plain concrete from 30 to 87 inches and 146 miles of reinforced concrete of sizes from 30 to 90 inches in diameter. The city has 1,200 miles of six and 439 miles of eight inch vitrified pipe. Mr. Hammond informed me that no concrete was used since 1905. The city is taking out about one mile of old concrete pipe per year and using vitrified pipe instead.

The wear or disintegration is mostly on the invert. Failure began about 20 years ago. A large amount of sanitary system is badly wasted. In many instances the soil in which the concrete lay was found more destructive than contents flowing in the sewers.

The experience of Philadelphia and Brooklyn makes clear the necessity for extreme care in the making and placing of concrete in sewers. Limestone aggregate should not be used. Care should be taken to secure a dense concrete with a minimum of cement.

It is my opinion that there is room for improvement in the making of vitrified pipe. It is important that the material be uniform in order that the material in a kiln may have the same vitrifying temperature. It is my opinion that concrete sanitary drains of precast type should not be used. Vitrified pipe is not affected by acids or alkalies, because there is no active element present in the material and the "vitrified" or glass-like surface renders it highly resistant.

Respectfully submitted,
J. C. McCABE,
Research Engineer

Accepted and placed on file.

Fro City Plan Commissio

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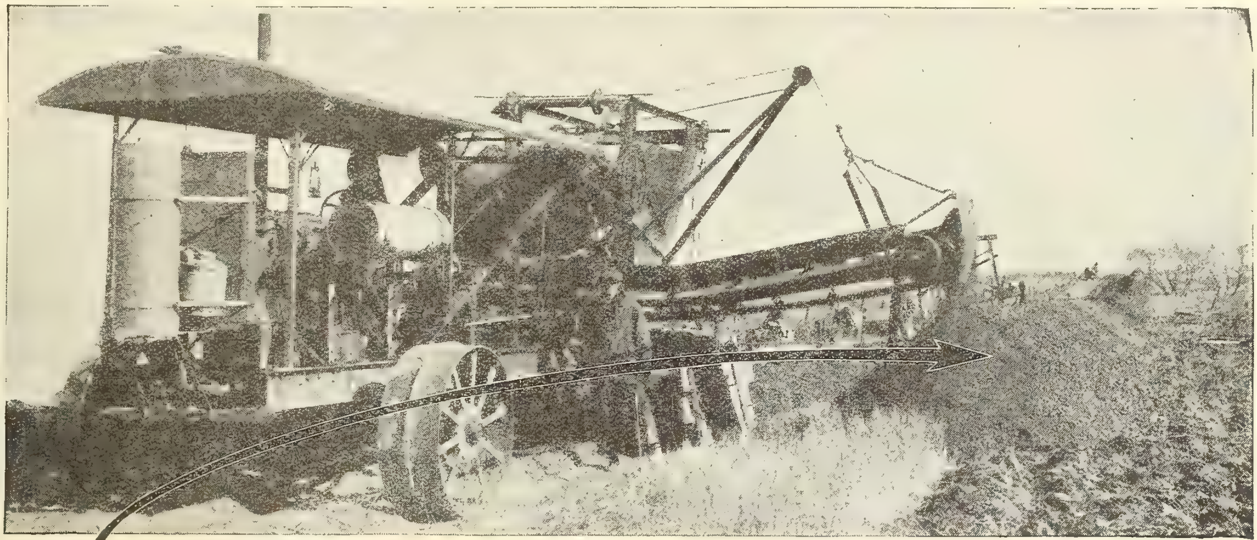

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Joe Kalil, of Cleveland, put his Buckeye on a hard shale job. He thought it would be too hard—but the Buckeye **kept on going.**

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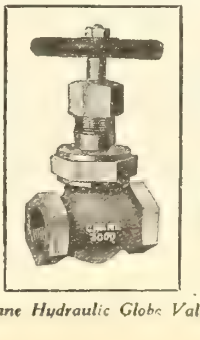

Crane Hydraulic Globe Valve

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Canadian Johns-Manville Co.

Rails
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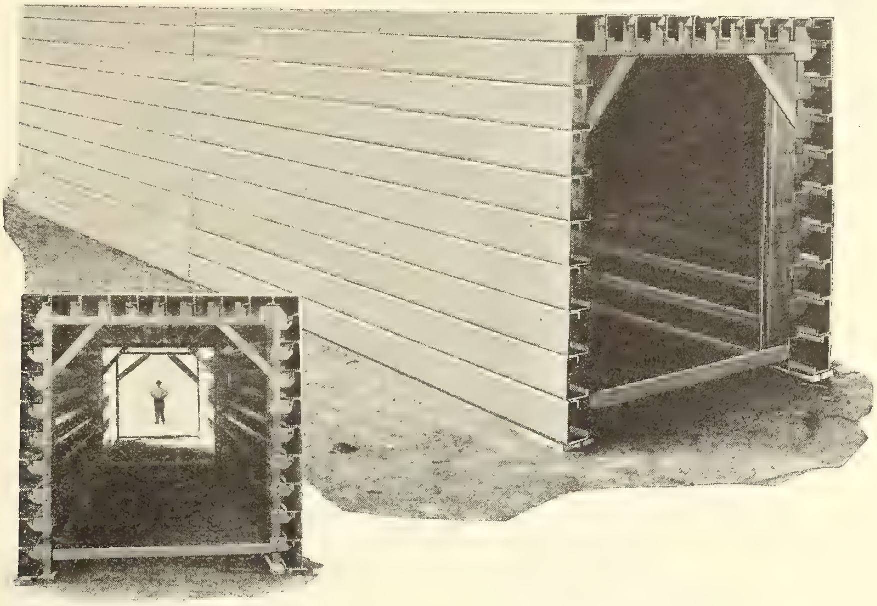

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Just another use for Heltzel "Armour Plate" Steel Road Forms but important to contractors who have culvert work to handle.

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Heltzel Steel Road Forms add constantly to your profits from the first day on the job.

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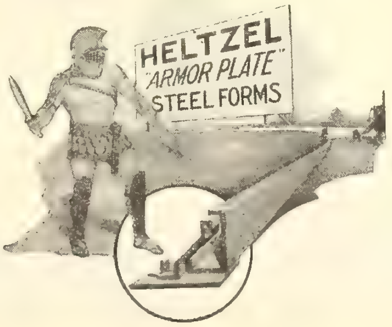

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- Canadian Steel & Wire Co.

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- Imperial Oil Company, Ltd.
- Vitrified Clay Pipe Publicity Bureau

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Rubble Stone
- Queenston Quarries Co.

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- Paris Sand & Gravel Co.
- Rogers Supply Co.
- Standard Lime Co.

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- Mussens Limited
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- Sturtevant, B. F. & Co.
- Waterous Engine Works Co.

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- Canada Wire & Iron Goods Co.

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- Oakley & Sons, Geo.
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- Horton Steel Works, Ltd.
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- MacKinnon Steel Company
- Reid & Brown Structural Steel & Iron Works
- Sarnia Bridge Company
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- Dake Engine Co.

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- Waterous Engine Co.

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- Pacific Coast Pipe Co.
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- Leckie Co., John

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- National Fireproofing Co.

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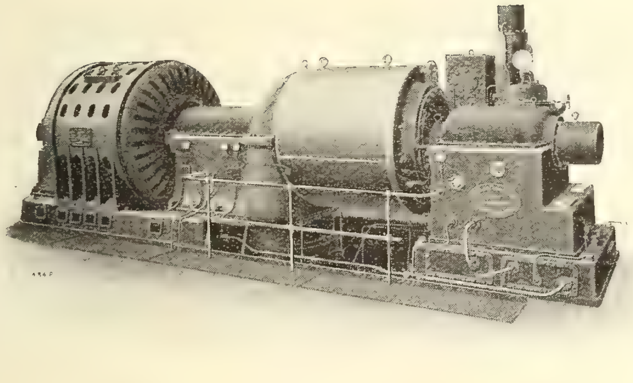
We carry a large stock of Structural Shapes and Plates and your requirements can be immediately filled. Our large shops, with a capacity of 36,000 tons annually enable us to turn out whatever you require, from the largest building to a few beams, in a surprisingly short time.



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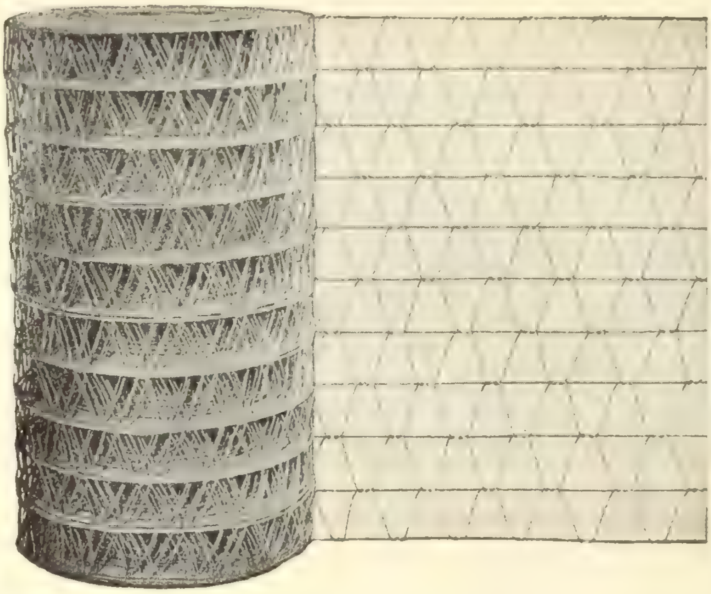
Concrete Roads Must be Reinforced
with
Triangle Mesh Wire Reinforcement

Concrete Endures

Materials entering into the composition of concrete are Nature's most enduring products. Particles of rock firmly held in a matrix of Portland cement mortar form a granite-like substance that withstands flood, fire and frost. In all weathers, in every climate, concrete strengthens with age.



Triangle Mesh Reinforcement in the roll made in 11 widths, 16, 20, 24, 28, 32, 36, 40, 44, 48, 52, 56 inches. Length of rolls 150 ft., 200 ft., and 300 ft.

A Concrete Surface does not rut

Rapidly moving wheels of motor trucks cannot tear away the concrete surface. They cannot cut through it, iron it out toward the edges or cause undulations. A concrete surface remains smooth under the heaviest traffic.

There is no form of road that is as economical, enduring and efficient as a concrete road reinforced with steel wire fabric. It is practically good for all time if the foundation and mixture are right.

Steel has an affinity for concrete, the two practically expanding and contracting equally. The greatest combination in the world is concrete and steel.

Concrete is enduring. Steel wire fabric embedded in it imparts great tensile strength at very little added cost. Why take chances by leaving it out?

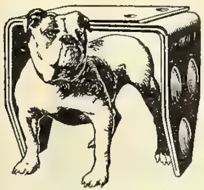
Manufactured in Canada by

The Canadian Steel and Wire Company
Limited

Hamilton, Canada

THE BULL-DOG FLOOR CLIP

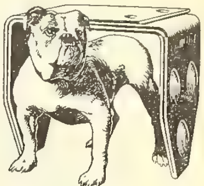
Modern Money Saving Simple Device for Laying Wood Floors over Concrete



Put the Bull-Dog
on *your* Pay-roll

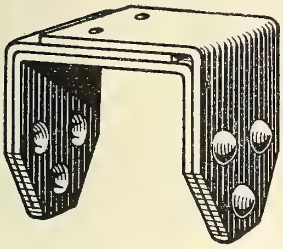
ON U. S. MARKET ONE YEAR—
OVER TEN MILLION SOLD

Saves Material—Saves Labor—Saves Money



Put the Bull-Dog
on *your* Pay-roll

ARCHITECTS & CONTRACTORS who have used BULL DOG FLOOR CLIPS say the BULL DOG METHOD is the best ever devised to hold a wood floor to concrete.



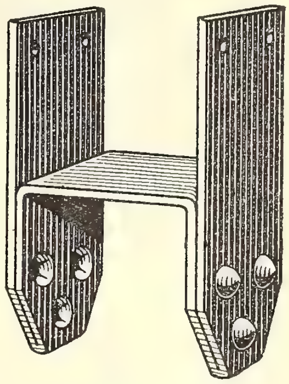
Canadian Pat. No. 216554
March 7, 1922

Bull Dog Floor Clip as manufactured and placed in soft concrete, which allows free use of floor.

NO CONCRETE FILL REQUIRED: USE 2 x 2 unbevelled instead of 2 x 3 bevelled sleepers.

ACTUAL MONEY SAVED by eliminating a concrete fill and by using 2 x 2 unbevelled sleepers amounts to over 4c. a square foot of floor area; and over 3c. against a cinder concrete fill.

REDUCE DEAD LOAD:—Approximately 18,000 lbs. per 1,000 square feet by eliminating concrete fill; Great Saving in re-inforcing steel is effected.



Canadian Pat. No. 216554
March 7, 1922

Bull Dog Floor Clip showing top members raised to receive floor strips.

SPEED UP BUILDING:—Unobstructed use of floor slab until you are ready to lay wood floor. Sleepers and finished floor can be laid at one time, thereby preventing costly delays waiting for fill material to dry out.

THE BULL DOG FLOOR CLIP is made of 20 Gauge KEYSTONE GALVANIZED COPPER-STEEL. They hold the sleepers so rigidly to the floor slab that buckling or squeaking of finished floor is impossible; neither will the finished floor dome up from moisture, which is often the case when a concrete fill is used.

ARCHITECTS:—By adopting The Bull Dog Method you eliminate all possibilities of hit or miss construction.

DRY ROT, which usually attacks a poor grade concrete or cinder-concrete fill and is in turn transmitted to the sleepers and finished floor, naturally will not take place; a slight circulation of air under the finished floor keeps it and the sleepers in perfect condition.

CONDUITS AND PIPES can be placed on top of the slab, right under the finished floor; are easy to get at; and are practically free from corrosion, whereas concrete fill corrodes them very quickly.

THE WESTERN STEEL PRODUCTS LTD., Winnipeg, Man.

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BRIDGE BEAUTY EXEMPLIFIED

IN A CONCRETE STRUCTURE AT BRANTFORD, ONTARIO

Grace of line and pleasing simplicity characterize the bridge erected at Brantford, under the supervision of Frank P. Adams, A.M.E.I.C., Brantford's City Engineer.

The arch ring is a solid barrel arch, the intrados being an ellipse. The span of the arch is 60 ft., the rise 12 ft., width 48 ft., and thickness of crown 18 inches. The arch ring is reinforced with 1 inch square corrugated bars at 12 inch centres placed 2 inches from intrados and extrados of the arch. ½-inch square corrugated bars are placed at right angles to the main reinforcement at about 36 inch centres.

The abutments are of solid concrete mixed in proportion of 1 to 7 pit run gravel and the arch ring is mixed in proportion of 1 to 4 pit run gravel.

Spandrels and wing walls are plain concrete gravity type retaining walls, mixed in proportion of 1 to 4 pit run gravel.

The wing walls are curved on a radius of 35 feet. The concrete railing is of the open baluster type over the arch ring and solid over the abutments.

The base, posts and railing were cast solidly in place and the baluster posts were made up on the ground. The many advantages of Concrete in the construction of bridges are now widely appreciated.

Specify
CANADA CEMENT
Uniformly Reliable

We maintain a Service Department to co-operate in all lines of work for which Concrete is adapted. Our library is comprehensive and is at your disposal at all times without charge.

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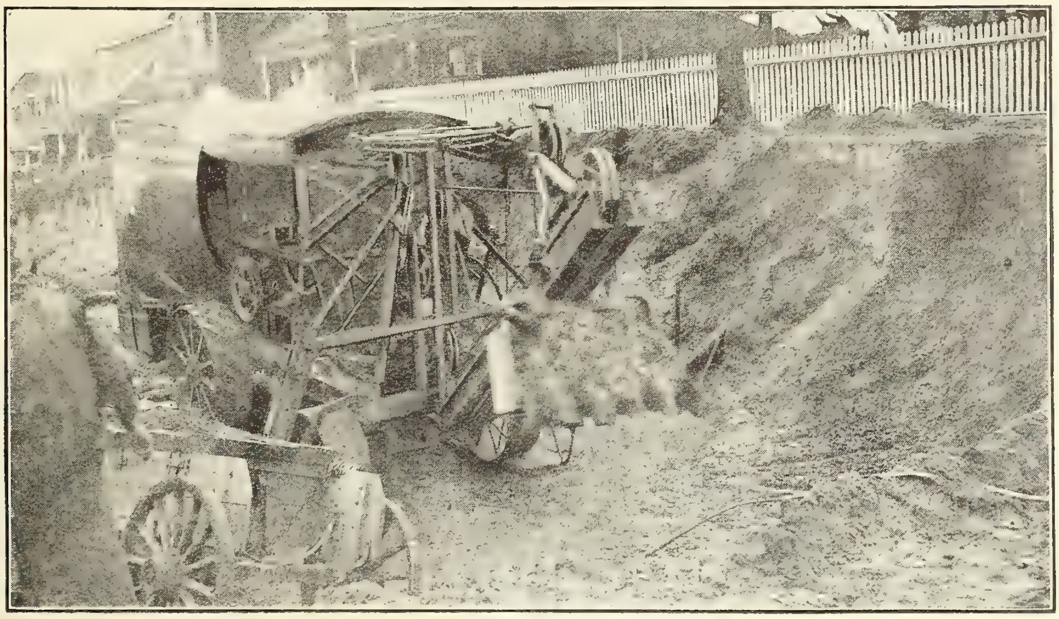
CONCRETE
FOR PERMANENCE

Canada Cement Company Limited

Canada Cement Company Building Phillips Square Montreal

Sales Offices at: Montreal Toronto Winnipeg Calgary



Let us help you make some money this season

Road grading at the rate of 400 yards per day with a Keystone and its Skimmer Scoop, with a crew of three men, certainly opens up many possibilities for you to put in low-priced bids for work, yet clean up nice profits for yourself. Others have done it—why not you?

Keystone Excavator

Model 4'23

Here you have an Excavator, weighing approximately 12 tons, operated by steam, and travelling under its own power, which with different scoops, can be used for any earth or material digging and moving job that you can put it to. For road work with Skimmer Scoop it is unbeatable. For ditching or excavation work, using Ditcher Scoop in place of Skimmer, the machine stays on the level, and backs up, taking the excavation with it —capacity 150 to 300 cubic yards per day. The working boom gives a lateral working radius of 28 feet—digs down to 16 feet—the boom swinging, not the excavator itself. Made in Canada and sold at a very moderate price.

Illustration at top shows a typical rough road grading job in Toronto—the kind the Keystone likes. At left notice a fine Keystone ditching job in Oshawa. Write for Keystone Booklet today.

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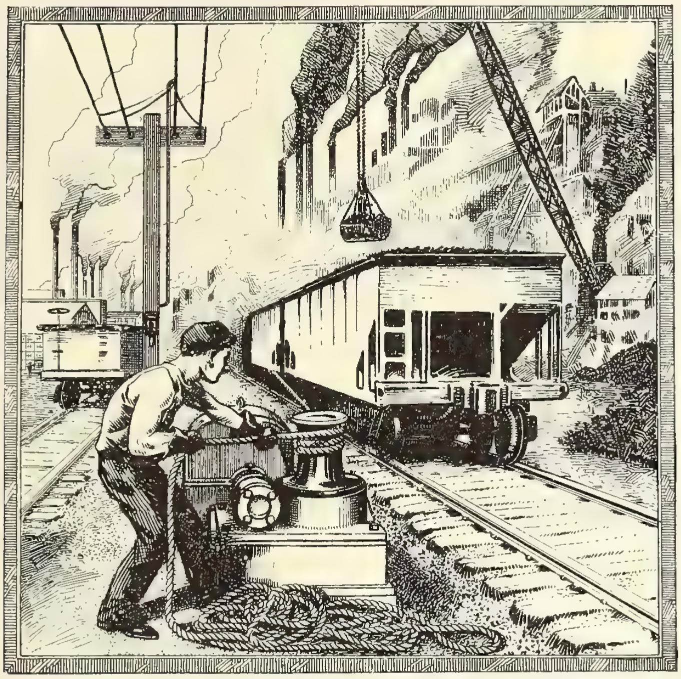
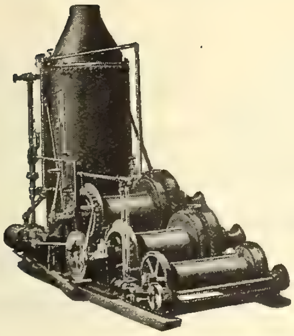
"MEAD-MORRISON"

CAR PULLERS

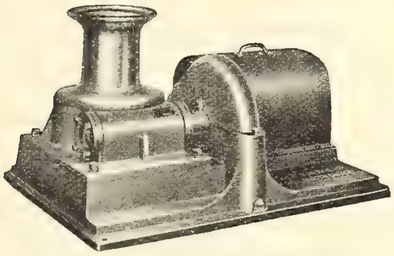
GRAB BUCKETS HOISTING ENGINES



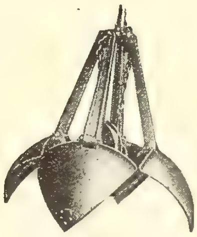
Draw bar pull 7,500 and 10,000 lbs. on a single line



Mead - Morrison double drum hoist with swinger



Car Puller



Orange Peel Grab

Made in Canada by

CANADIAN MEAD-MORRISON CO
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CANADA CEMENT BUILDING
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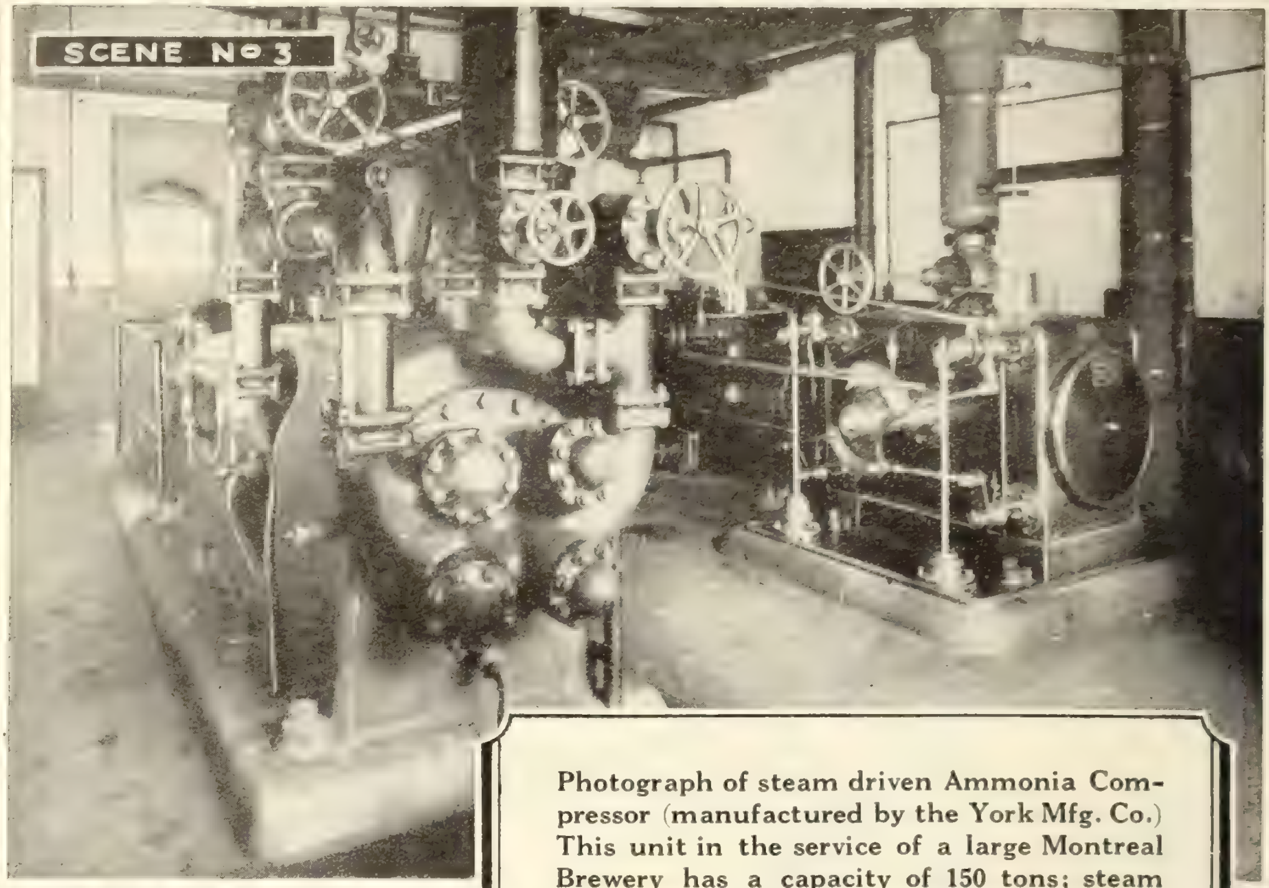
WORKS: WELLAND ONT.



Photograph of steam driven Ammonia Compressor (manufactured by the York Mfg. Co.) This unit in the service of a large Montreal Brewery has a capacity of 150 tons; steam pressure 150 lbs.; speed 65 R.P.M.

Imperial Lubricants in use:—

Imperial Cylinder Oil.
Imperial Atlantic Red Oil.
Imperial Polar Machine Oil.

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Expensive machinery warrants the protection which Imperial Lubricants assure through correct lubrication of every bearing, journal and other moving part. Plant operation is made more profitable by the standardized use of the right grades of Imperial Lubricants on your different units. When you are confronted with a difficult lubrication job write our nearest branch office for the expert advice and service of our lubrication engineers.

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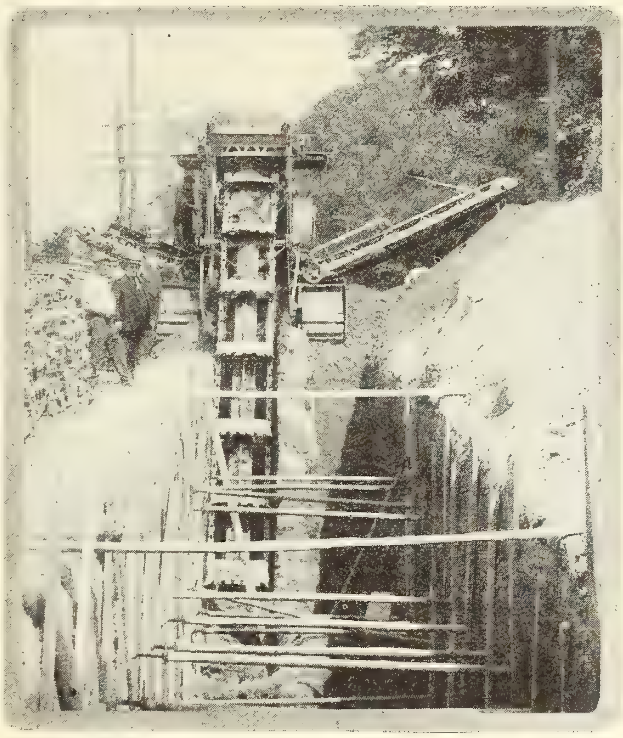

Do you measure power, strength, speed or long life in pounds weight?

Compare your automobile with those built 20 years ago—a modern steel structure or bridge with the first ones built—all are admittedly **finer and better types, all are lighter in weight.**

That is the triumph of modern engineering—to develop greater power, strength, speed and long life, by the use of special steels and the proper distribution of weight.

That is why Parsons Trench Excavators combine as **no** others those qualities essential for the most successful trenching work—they are not handicapped by a single pound of excess weight— that's the result of 17 years of successful engineering.

Ask us for complete details.

MUSSENS LIMITED

Montreal Toronto Winnipeg Vancouver

MUSSENS M LIMITED

"GET ME A JOB ON A 20-B"

The writer of the above quotation (a shovel operator of many years experience) was operating a shovel of another make alongside of a

BUCYRUS

20-B BULLSEYE

IT did not take him long to see the difference. He noted:

1—— The greater ease of operation. How the operator doesn't have to leave his seat at any time during operation—

2—— The simplified control, 3 levers with a release throttle allowing him to lower his load without using the foot brake—

3—— THE GREATER POWER at the dipper teeth—

4—— The greater speed, because of two part hoist and faster swing—

5—— The bigger boiler, equipped with patented scale chamber which automatically keeps the boiler clean—

6—— The outside dipper sticks, with a solid steel boom, a stronger yet lighter construction—

7—— The strongest, simplest caterpillars ever put under a shovel with half as many parts as any other—

And—— MUCH MORE—no wonder he said: "Get Me a Job on a 20-B"

Also furnished with
**DRAGLINE
CLAMSHELL
CRANE or
SEWER
EQUIPMENT**

**SEND
for BULLETIN
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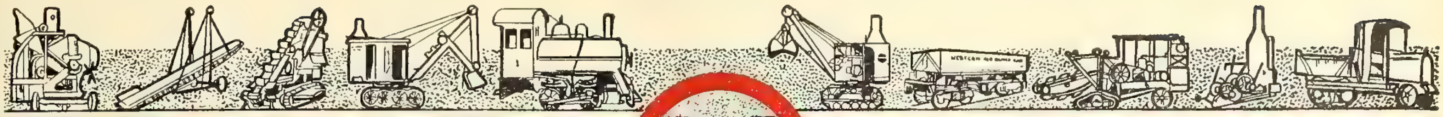

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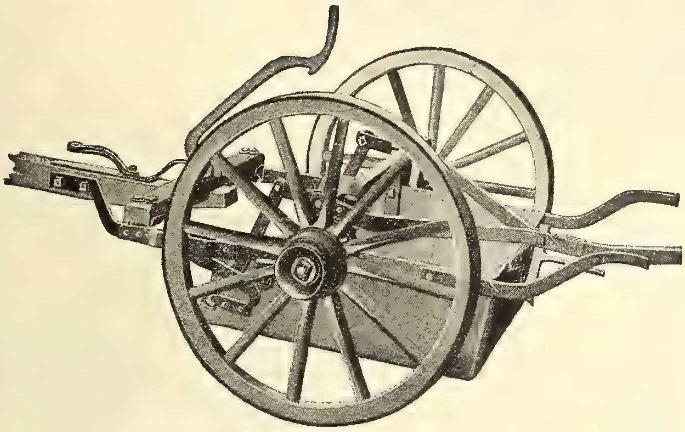

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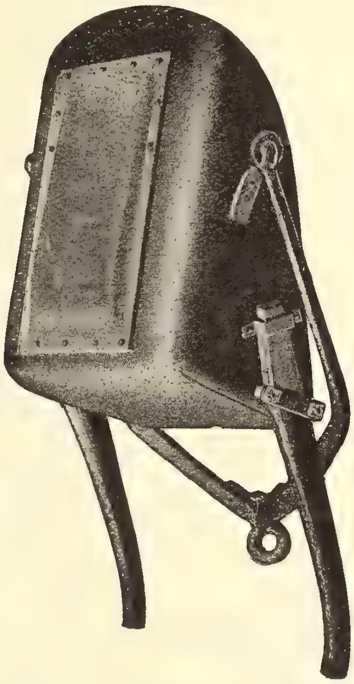
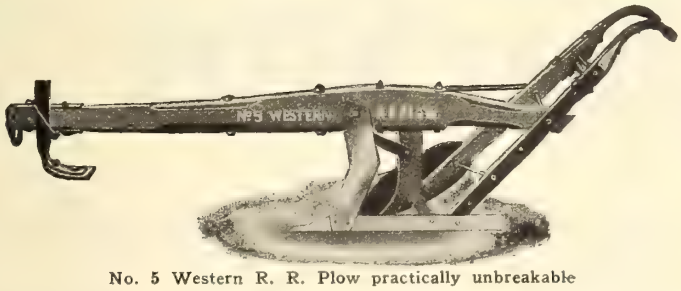


Western Dragscraper, note the durable bottom



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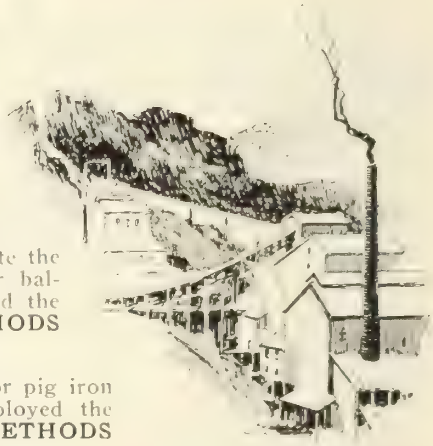

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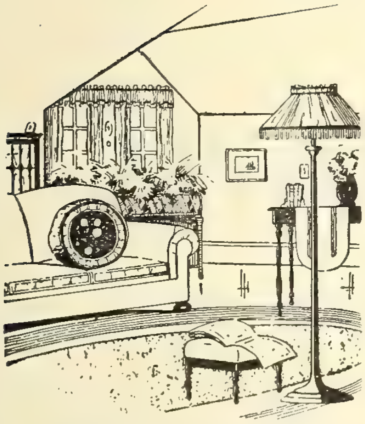

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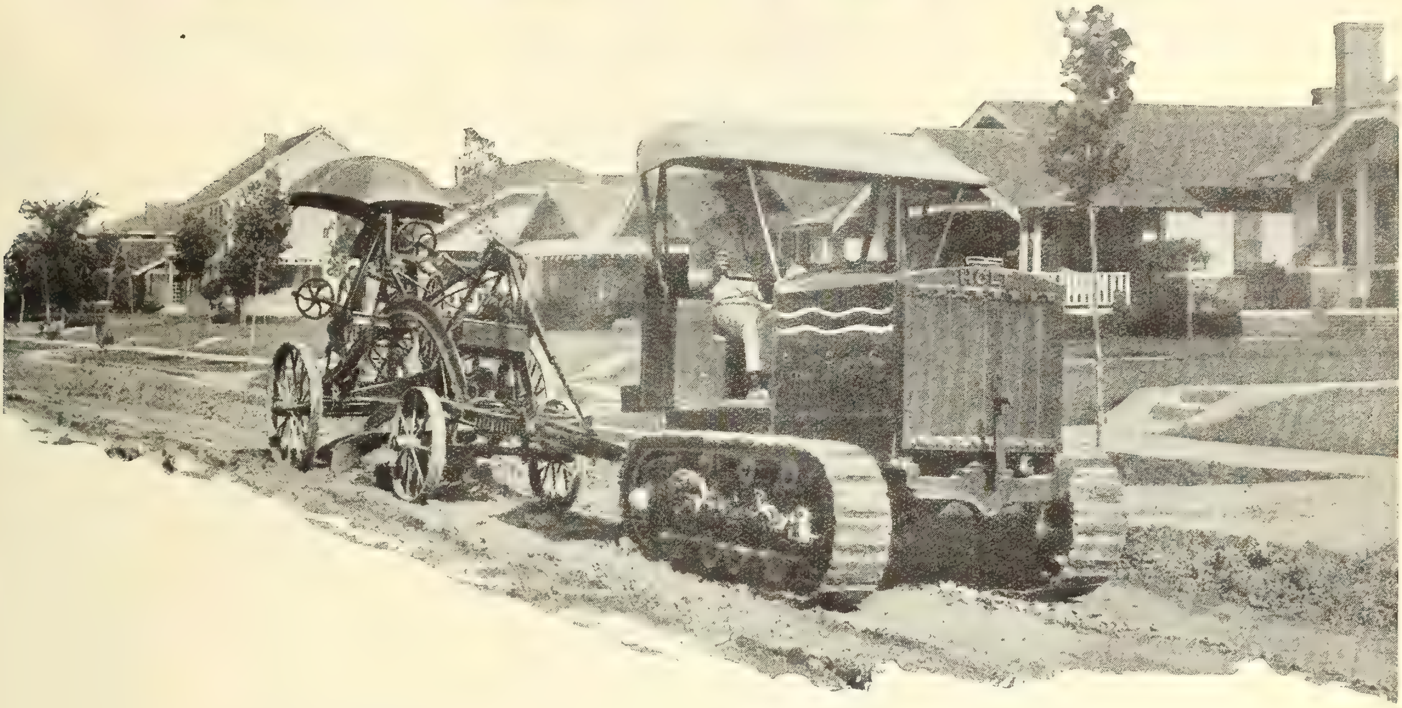

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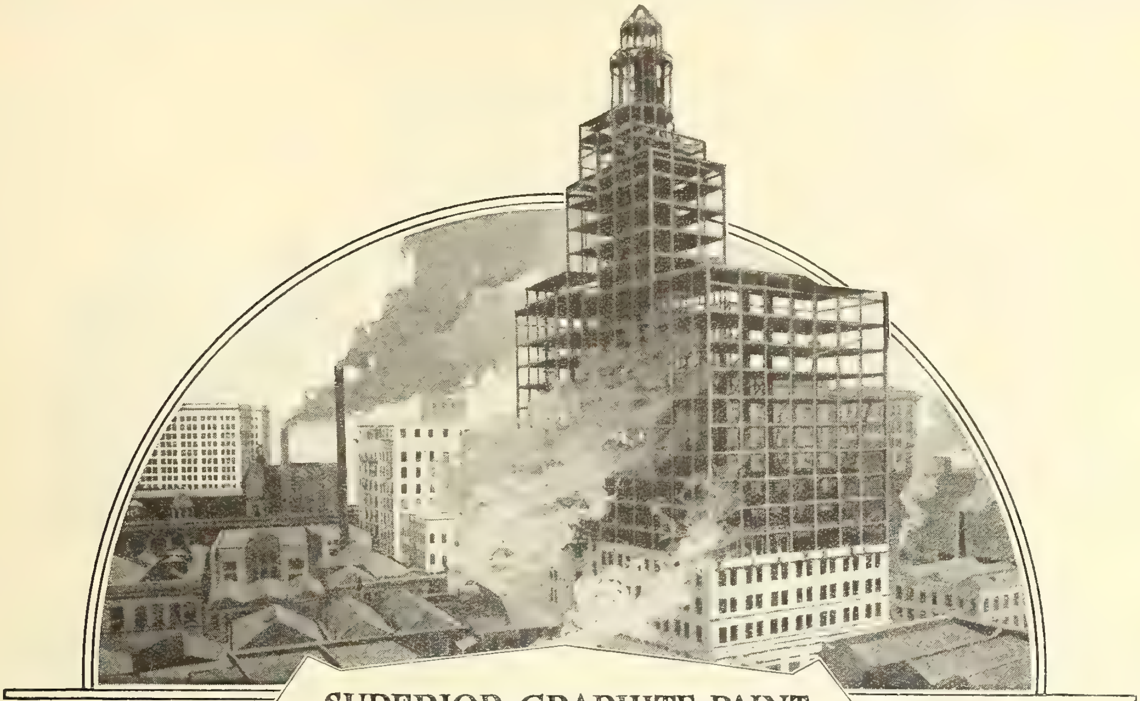

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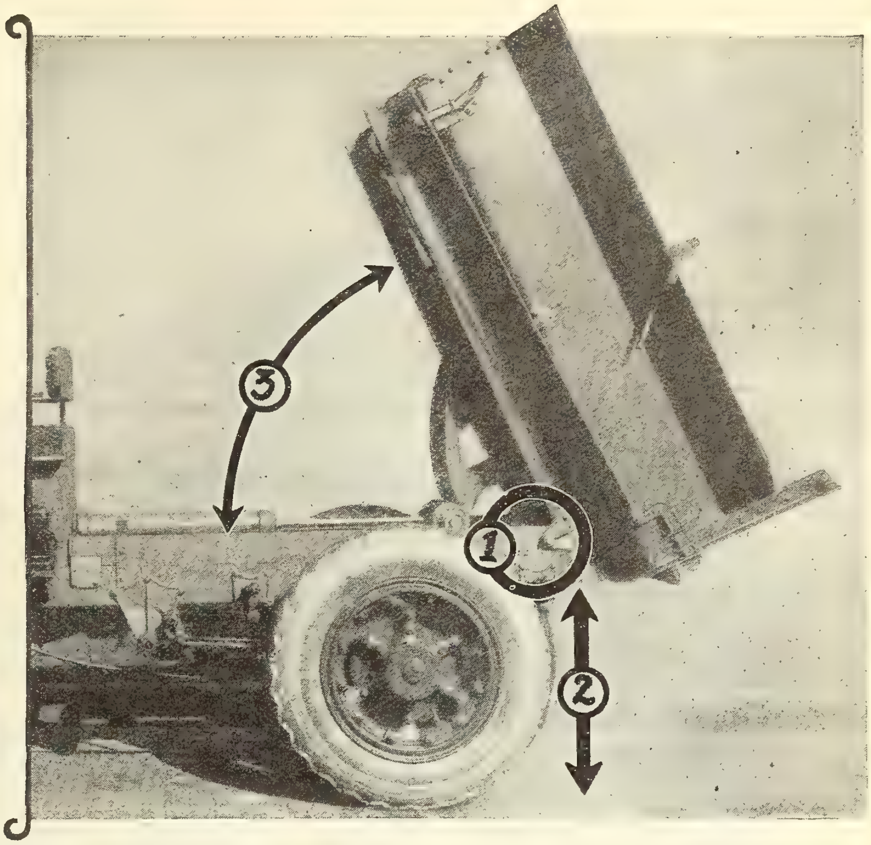

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Should Federal Aid be Extended?

Scanty encouragement was offered by Premier Mackenzie King to the delegation that waited on him last week to urge the extension of the Canada Highways Act, by which $20,000,000 was made available to the provinces for road construction. The act gave until March 31, 1924 for the provinces to avail themselves of their allotments, but it has been found that the life of the Act is not sufficient to enable Manitoba, Saskatchewan, Alberta and Prince Edward Island to qualify for their full share of the federal grant. In spite of this fact, the Premier has indicated that the government will not see fit to offer any relief, much less make available another $20,000,000 as had been urged by the provincial premiers, the Canadian Good Roads and local associations.

This action is extremely unfortunate in that it puts somewhat of a damper on the road building enthusiasm of the provinces, which have been spurred to action in the matter of highway construction by the assurance that federal assistance would be available. That four provinces will be unable to qualify for their share of the grant is not due to any procrastination on their part. On the other hand, as expeditiously as possible, they prepared their maps for approval by the federal government and began work. In many cases, however the provinces were not properly organized for intensive road building and they had to amend their own provincial highway legislation and in many cases alter their existing standards of design and types of construction. All this prevented an early start on the federal aid roads and has consequently prevented four provinces from qualifying for their shares of the $20,000,000 grant.

The existence of a certain measure of federal responsibility for road construction seems to us to be beyond question in spite of Hon. Mr. King's claims to the contrary. For that reason, the principle of the Canada Highways Act should be made generally applicable instead of conferred to a limited period of time. However, even though further grants are not offered, in justice to the provinces that have, through various circumstances, been prevented from completing their programs, let the time of the present act be extended. The Dominion should not break faith with the provinces that in reality are bearing the greater share of the burden.

Railways and Good Roads

The Railway Association of Canada has issued a pamphlet on the subject "The Railways and Good Roads" in which it makes a strong feature of the advisability of "Right Angle" extensions into new territory, giving facilities to more farms and more districts, rather than increasing the facilities over regions that are already prosperous and fairly well supplied with transportation. The pamphlet also raises the question of the necessity of some form of control of rates on motor transport lines, and, finally, draws attention to the comparative condition under which steam railways and motor transport lines operate, namely, that steam railways build and maintain their own right-of-way, or whereas, on the other hand, the general taxpayer provides and maintains the motor road; and it questions whether this is really the intention of the public. In conclusion, the pamphlet states that the railways are earnestly in accord with the expenditure on highways, provided generally speaking:—

1. That the money available be used to open up areas that lack transport facilities rather than to duplicate and elaborate present facilities.

2. That they are constructed so as to take care of heavy traffic as well as light, up to the limit of speed and weight prescribed by law.

3. That the new common-carrier—the motor truck or autobus line—be placed on a parity with other common carriers in having:—

(1) to be chartered or licensed by some public regulating tribunal, such as a public utilities commission vested with the needed power to exclude unnecessary and wasteful duplication of existing steam or electric services;

(2) to file tariffs and submit to rate regulation similar to that of the railways;

(3) to provide for the safety of the goods or persons entrusted to them;

(4) to give assurance of their financial responsibility, i.e., their ability to pay indemnities in case of accidents or losses, and their possession of assets fixed within the jurisdiction;

(5) and to pay for their road-bed (the use of the highways) on a ton-mile, passenger-mile, or gasoline consumption basis.

Minimum Requirements for Small Dwelling Construction

Through the initiative of U.S. Secretary of Commerce Hoover there has just been issued by the U.S. Department of Commerce a report entitled "Recommended Minimum Requirements for Small Dwelling Construction." The co-operation of many individuals and organizations with Secretary Hoover's department, with the dominant thought of public good supplanting any self interest, has resulted in this notable and worthy contribution to building standards.

It hits at the methods and practices now generally in use in the design and construction of dwelling houses and which are the result of blindly following tradition and past custom. There seems to be no other reason for the thickness of masonry walls used for ordinary one and two-storey dwellings than a survival of the belief that such walls should act to a large extent as parts of a fort.

Engineers and architects have doubtless previously made the simple computations necessary to show that the actual loads coming upon the walls of the ordinary one or two-storey house are ridiculously small and are, in fact, only a small percentage of the working loads which engineers long have used in the design of large and important bridges and buildings.

The Recommended Minimum Requirements for Small Dwelling Construction which resulted from the appointment of a Building Code Committee removes many of the unnecessary limitations which the common practice in house construction seemed to require and for which the home owner has to pay. Instead of 12 inch brick walls for two-storey buildings a thickness of 8 inches is permitted.

Concrete Construction Detailed

Recognition is also given to types of construction other than those so well known. The use of concrete both plain and reinforced is provided for in the code and recognition of the strong monolithic character of this structural material is given by allowing exterior walls to be 6 inches thick. The thickness of walls of hollow building tile and hollow concrete block is also placed more clearly on a basis of the actual strength of these walls than on arbitrary requirements. Walls of hollow building tile or hollow concrete block 8 inches thick are allowed for the uppermost 20 feet of buildings limited to 30 feet high.

The use of reinforced concrete is placed on the same general basis as large buildings and bridges, examples of which have become so numerous and well known. Dwellings of this type may be designed in accordance with the well recognized principles of reinforced concrete design to withstand the loads to which they will be subjected. However, certain requirements are provided which are based more on the practical work of getting the concrete into the forms. Double walls of concrete providing an insulation air space may be constructed with 6 inch aggregate thickness of concrete cast in place. The use of large pre-cast units each of which may be storey height and form an entire one-storey wall of one side of the house is permitted. Concrete houses provided with a reinforced concrete framework similar to that used in large buildings but with enclosing and partition walls of concrete plastered on metal lath are permitted in this code. In fact, new methods of construction which give great promise of developing firesafe types and low costs are provided for in the code.

Minimum Requirements are Ample

The minimum provisions of this code are safe. They are the result of careful work by a committee which has no other interest than to serve the public to the best of its ability. This committee had at its disposal the most complete compilation of information that has ever been assembled by any committee working on the subject of house construction. Adoption of the code or at least incorporation of the important major parts of its provisions into city building regulations is the next step to make this valuable work of Mr. Hoover's building code committee the means of reducing the cost of dwellings, without any sacrifice of required strength or fire safeness. In fact, the opportunity which it gives for invention and the exercise of engineering and architectural skill will insure that these objects will in the end be attained for less cost than at present.

Material Handling Equipment for Foundries

The Canadian Link-Belt Company, Toronto, has recently issued a very comprehensive and instructive book devoted entirely to the application of Link-Belt products to the modern foundry, it is not only profusely illustrated with photographs of actual installations showing the most recent Link-Belt installations, but line and wash drawings are given to cover the subject of proper and efficient installation. Going further than the usual "catalogue" this new book tells, in print and picture, of the practices and methods of six large and widely known foundries. Increasing production, overcoming labor shortage, practising economy in time and money, are the ever present problems confronting every foundryman. This book is an exposition of methods employed by others to accomplish these desired ends. The book is known as "No. 690."

Accurate Estimating the Secret of Profits

How to Estimate for Concrete Construction—The Various Items Involved in the Erection of a Building and the Basis for Properly Gauging Their Cost

By FRANK R. WALKER*

If estimates are to be accurate, so that the contractor will feel safe in taking work on his own figures, the various branches of work should be estimated in exactly the same manner in which it is erected in place in the structure, using each completed operation as the basis of measurement and pricing the work. Regardless of the method used in preparing the estimate, if the contractor's field organization is incompetent or inefficient the best prepared estimate will not make the contractors' business a profitable one.

Each class of concrete work should be estimated separately, such as footings and foundation walls, column footings, retaining walls, reinforced concrete columns, beams and girders, stairs, structural floor slabs, etc., because each is a separate and distinct class of work, involving special details of construction not found in the others, and subject to considerable variation in the cost of the completed units.

When estimating the cost of concrete for foundations and retaining walls, the cost of the wood or metal forms, reinforcing steel, and the cost of the concrete itself, should each be estimated separately as they are all separate kinds of work and in many instances installed by different trades.

Estimating Concrete

The concrete itself should be estimated by the cubic foot or cubic yard. The cubic yard method is preferred because the costs are more easily worked out on that basis. Nearly all tables of cement,sand, gravel or crushed stone are stated in the quantities required per cubic yard of concrete, which makes a more workable unit than where the cubic foot method is used.

Form work should always be estimated by the number of square feet of forms required for any given piece of work; for instance, if a wall is 60 ft. long and 8 ft. high and requires forms on both sides of the wall, it will require 60 sq. ft. of forms. Light walls will require only 2 or 2½ ft. of lumber, b.m., to construct 1 sq. ft. of forms complete, while heavy retaining walls will require 3½ to 4 ft. of lumber, b.m., per square foot of forms. Naturally, the more lumber required per square foot of forms, the higher the material and labor costs will be.

It is not a difficult matter to strike an average of the amount of lumber required to construct 1 sq. ft. of forms for various types of walls, and by so doing valuable costs both by the square foot of forms and per thousand feet of lumber, b.m., are furnished. This is especially valuable when comparing costs on various jobs. The cost of removing the forms should also be kept separate from the cost of framing and erecting, but the same unit of measurement should be used throughout.

Reinforcing steel should be estimated by the pound or ton, estimating the cost of steel at a certain price. The labor bending the steel should be kept separate from the cost of placing the steel in the structure ready to receive concrete. When estimating the quantities and costs of reinforced concrete superstructures, each class of work should be estimated separately as previously described, for foundations and retaining walls, but the average concrete building contains at least four different classes of reinforced work, namely: columns, beams and girders, floors and stairs.

Estimating for Columns

The forms for square concrete columns should be estimated by the square foot, taking the entire girth of the column and multiplying by the height. As an example, take a column 17 in. square and 12 ft. high. Forms will be required on all four sides of the column, making a total girth of 72 in. or 6 ft., which multiplied by the height, will give 72 sq. ft. of forms required for each column. Where 2 in. lumber is used, it ordinarily requires about 2½ ft. of lumber, b.m., to construct 1 sq. ft. of forms, including bracing, clamps, etc. In order to prepare accurate estimates on the cost of this work, it is advisable to estimate the cost of framing and erecting the column forms, separate from the labor cost of removing them after the concrete has been placed. The same units of measurement should be used in both instances.

The forming for octagonal concrete columns presents a somewhat different problem in estimating. Regardless of the diameter of the column, there are eight different sections to be formed, and it does not cost any more to frame an 8-in. section than a 6-in. one, so it is a question whether it is not advisable to estimate the labor cost at a certain price per column, making a slight allowance for the difference in size. However, regardless of the diameter of the column, the labor cost of framing and erecting the forms in place should be kept separate from the labor cost of removing the forms after the concrete has been placed.

Metal moulds are ordinarily used for forming round concrete columns. The column moulds are fabricated in the shop and delivered to the job in sections, so that a certain price should be allowed for the erection and removal of each column mold, stating the diameter and height of the column, and whether a plain shaft or one having a flared head, as the latter cost considerably more to erect than the former. The cost of the erection of the forms should be kept separate from the removal of them if possible.

The column reinforcing steel should be estimated by the pound or ton. Inasmuch as the spirals are usually furnished fabricated and the steel cut to length, the labor estimate should include assembling, wiring and placing, based on the actual weight of the steel used.

The concrete in the columns should be estimated by the cubic foot or cubic yard; the materials being estimated according to the proportions of cement, and and gravel used, and the labor costs of mixing and placing should be estimated separately.

---

*Before the American Concrete Institute.

Beams, Girders and Lintels

There is a diversity of opinion among contractors regarding the correct method of estimating forms for concrete beams, girders, and lintels. When used in connection with concrete floor slabs, the depth of the beam or girder ordinarily includes the thickness or depth of the slab, so when estimating the quantities and cost of beam and girder forms, I feel the proper method is to take that portion of the beam or girder that is exposed beneath the slab, while some contractors estimate forms for the full depth of the beam. For instance, if a concrete beam is 16x24 in. in size and the thickness of the slab 6 in., the actual depth of that portion of the beam requiring forms is 18 in., the other 6 in. being made up in the thickness of the concrete floor slab. Where beams and girders are used around stair well openings, elevator shafts, door and window lintels, etc., where one side of the beam is exposed for the full depth, then the girth of the beam would be 18 in. plus 16 in. plus 24 in. or a total of 58 inches.

Beams may be constructed of either 1 or 2-in. lumber or a combination of the two, but the labor cost per square foot remains practically the same in either instance. The 1-in. lumber is somewhat easier to !frame but it requires more bracing than the 2 in. lumber, so that the advantages of one practically offset the other. When the estimated labor cost should be by the square foot of forms actually constructed, the labor cost of framing and erecting the forms should be kept separate from the labor cost of removing the forms after the concrete has been placed.

The reinforcing steel should be estimated by the pound or ton, based on the actual amount of steel required. Bending and fabricating should be kept separate from the labor cost of placing the steel in the forms ready to receive the concrete.

Reinforced Concrete Floors

There are so many types of reinforced concrete floors being used today that it is almost necessary to use a different method when estimating each type. It is true, the square foot method of measuring the forms can be used in all of them, but there are so many special conditions entering into the construction of the forms for the various types of floors, that each must be given careful consideration when preparing the estimate. The amount of lumber required to construct 1 sq. ft. of forms for reinforced concrete floors will vary from about 2¼ to 4½ b.m., which includes sheathing, joists, stringers, uprights, sills, wedges, bracing, etc. This variation is due to the height of the ceiling. For this reason, it is well to check the square foot method with the price per thousand feet of lumber, B.M., before pricing the estimate

It is not necessary to figure out the exact quantity of lumber required in the construction of the slab forms for each job estimated, but a table can be easily prepared showing the approximate amount of lumber required to construct 1 sq. ft. of forms for different slab thicknesses and varying ceiling heights. This will be close enough for estimating purposes, because I have never yet seen the job where the quantity of lumber used was the same as the quantity estimated.

Before deciding upon the material cost per square foot of forms, it is advisable to take into consideration the number of times each floor of forms may be used in the construction of the job. For instance, if it requires 3 ft. of lumber, b.m., to construct 1 sq. ft. of forms, with lumber at 5c. per ft., b.m., the lumber cost 1 sq. ft. of forms would be 15c. If the lumber may be used two or three times in the construction of the job, this cost may be divided by 2 or 3 to obtain the lumber cost per square foot of forms. To this a small allowance should be added for breakage, waste, nails, etc.

Solid Concrete and Special Floors

Where solid concrete floors are used in connection with beams and girders (either of reinforced concrete of structural steel, fireproofed with concrete), the exact floor area between beams and girders should be obtained, and should not include the width of the beams and girders, as these forms have previously been taken care of under beams and girders, and all duplication of quantities should be avoided, if accurate estimates are to be obtained.

The same method should be used when estimating floors of flat slab construction except that the area of the depressions at the column heads should be taken off separately, as there is considerable extra labor involved in framing out for these depressions. The entire area of the floor may be estimated at a certain price per square foot, and then an additional allowance may be made to take care of the additional labor required for framing of depressions in slabs.

Other types of floor construction where concete is used in conjunction with clay or gypsum tile, metal tile, "domes" or tin pans as they are commonly called, usually require the lightest type of temporary framing for forms on account of the small weight of the floor slab itself. In all instances the exact floor area should be obtained and the work priced by the square foot of forms. On work of this kind, some contractors cover the entire floor with wood sheathing while others place only a 2-in. x 6-in. or 2-in. x 8-in. plank 12, 16 or 20 in. on centres, to support the ends of the tile or domes and form the bottom or soffit for the concrete joist which is to be placed.

It is certainly advisable to keep separate costs on the various types of floor construction both by the square foot of form and by the thousand feet of lumber, B.M., as this helps materially in preparing more accurate estimates, permitting a comparison of costs by both methods.

Labor in Relation to Volume of Concrete

The actual concrete on all of the various types of floors should be estimated by the cubic foot or cubic yard, but there is a vast difference in the labor cost of placing concrete on a job having 10 or 12-in. floor slabs than those using clay tile or metal domes, having concrete joists 4 or 5 in. wide with 2 or 2½ in. of concrete placed over the top of the tile themselves. The former will require 4 or 5 times as much concrete per square feet of floor as the latter.

On heavy slabs it is possible to place a large amount of concrete in a comparatively small floor area, while with the combination types of floor, it is necessary to cover a large floor area and place a comparatively small amount of concrete. Floors of this type require considerable extra labor placing the concrete in small joists, using care to see that all reinforcing steel is covered, as well as extra labor in spreading and grading the concrete for the thin top slab. While the cubic foot or cubic yard method of measurement may be used for either type floor, the labor cost on one will be much higher than on the other.

Where the floors are to have cement finish top, the top should be estimated separately in all instances. The thickness of the top may vary from ½ in. to ¾ in. in thickness and is composed of cement and sand, an entirely different aggregate than the mass concrete. This will involve separate material and labor costs, such as cement finishers and helpers, placing screed.

Method of Estimating for Concrete Stairs

Nearly every contractor has his own method of estimating concrete stairs. Many take the underneath surface or soffit of the stairs to obtain the forms required, while others take the area of the soffit plus the number of lineal feet of risers. It is a difficult proposition and one that is not easily checked

I have used the folowing method of estimating concrete stairs for a number of years and it has worked out very well:

I first take the length of the stringers of each flight of stairs, making a note of the number of treads in each. According to my exeprience on the job, the most time is required in laying out the stairs, cutting the stringers and placing them ready to receive the sheathing and risers. I usually allow a certain number of hours carpenter time to lay out cut and erect the stringers. I then estimate the sheathing in the same manner as is used in estimating slab forms, making my allowance in the price. I then mention the number of treads and the length of them, together with the number and length of the risers to be placed. In making up my estimate in this manner, I have found my estimated and actual costs compared very favorably.

The concrete is estimated in the usual manner to obtain the number of cubic yards of concrete to place.

If the stairs are to have a cement finish, I usually allow 18 in. to take care of the width of each tread and riser and multiply this by the length of the treads and the number of treads to obtain the number of square feet or finish.

When estimating the quantities of mesh or fabric reinforcing, I think the actual area of the surface to be covered should be obtained and then a certain allowance made to take care of the laps, the same as is used when figuring wood sheathing or flooring.

Separate Items for Plant and Equipment

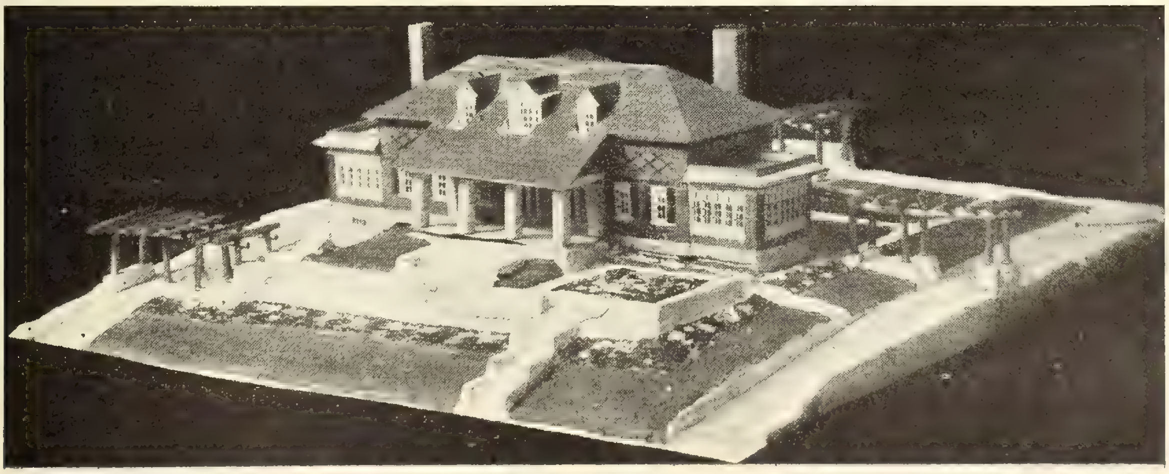
In my opinion, the item of plant and equipment should be estimated separately, allowing a certain price for concrete mixers, hoisting engines, hoisting towers, and other equipment, as in many instances this cost would be the same whether the job contained 1,000 or 5,000 cu. yd. of concrete, so that if this is estimated separately, it is much easier to obtain costs from the work that are authentic and of value when preparing future estimating.

Architect Models His Houses in Paper

And so Presents his Client with an Accurate Replica to Scale of the Finished Result—Perspectives are Unnecessary and Alterations are Easily Effected

A firm of architects practising in Guelph, Ont., have evolved an original method of presenting their work to their clients. Messrs. Coales and Dangerfield, the architects in question, make a practice of modelling to scale all their jobs before work is actually commenced, and the client is thus able to satisfy himself with an eighth scale model, that the job is going to be all that he could desire.

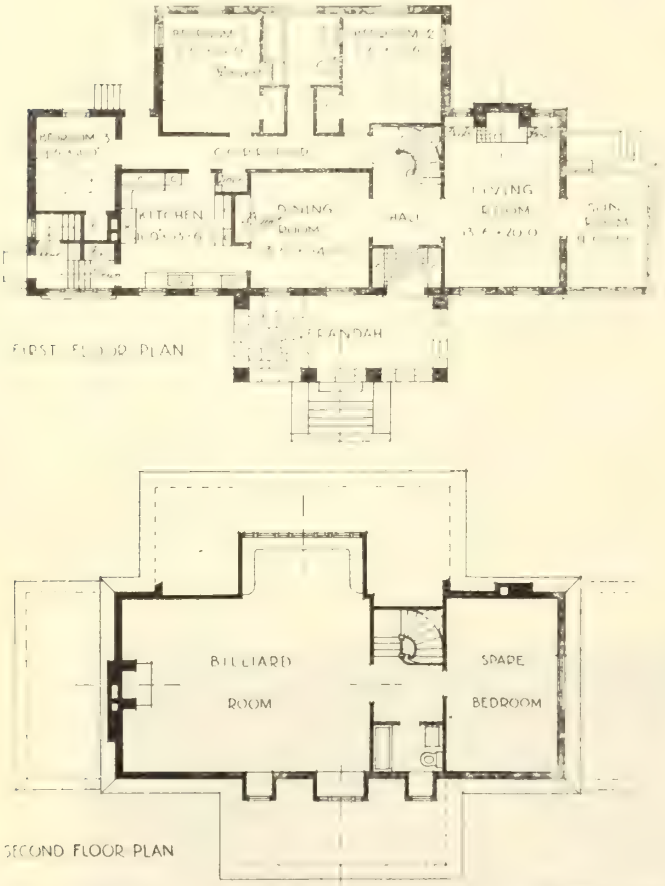
The models in question are made out of a stout cartridge paper generally of a scale of eight feet to the inch. They take no longer, if as long, to prepare as a perspective sketch which they replace. Perhaps the greatest advantage is the ease with which minor alterations can be made. For instance, take the pitch of a roof; if it is too steep or too low, it is only a few minutes' work to make the necessary alterations; or again, the positions of dormers, chimneys, etc., may easily be changed as required.



Paper models enable the owner to visualize his future home better than perspectives

A photograph of the model from the rear

The model is colored to represent the natural colors of the various materials used, the colors being applied with a special medium, with which it is possible to obtain actual texture of the materials required, such as roughcast, etc. In the case of the residence illustrated, the owner lived in Chicago and was unable to visit the site. The model was photographed and the photographs forwarded to the client.



The floor plans with the model give the owners all the necessary data

The grounds and general layout were modelled in plastacine and cast in plaster and colored. It is also possible to model the whole layout in paper.

Since making the model illustrated the architects have perfected a means of showing naturalistic objects such as trees, shrubs, flowers, etc. They also propose in the near future to photograph the site and then work in a photograph of the model, showing the house as it will actually appear when completed.

Measuring Sand for Concrete by a New Method

The "Inundation Method" is the Latest Idea in the Attempt to Determine a Scientific Way of Proportioning Concrete

The reliability of concrete construction is likely to be increased, and the cost in some cases reduced, by the application of a newly-developed method of measuring sand which is now being tested at the Bureau of Standards of the Department of Commerce. The method has been termed the "inundation method" and consists of measuring sand in a container which has been partly filled with water before the sand is put in, so that when the sand is in the water is up to the top and the sand completely soaked.

The volume occupied by a given amount of sand when shoveled into a measuring device varies with the moisture content of the sand; the difference in measured volume between dry and moist sand being usually from 10 to 15 per cent and occasionally running as high as 50 per cent. But it is found that if the sand is completely soaked or "inundated" uniform measuring results can be obtained no matter how much the original moisture content may have varied.

A rich concrete is not necessarily stronger than the concrete the contractor intended to make, for the sand has brought in some water in addition to that which is added on purpose; and if this extra water is not allowed for and the amount of water added correspondingly decreased the concrete will contain too much water. It will be sloppy, and, when set, will not be dense enough to give the necessary strength.

It is hoped that with the inundation method it may be possible to specify concrete by the strength required rather than by arbitrary proportions. The contractor can then find the proportions of the materials he is using that will give the requisite strength and can adhere closely to these proportions. The result will be a concrete whose proportions are more nearly what they were intended to be, and with which a lower factor of safety can be used.

A description of the system was given in a paper read before the recent convention of the American Concrete Institute by G. A. Smith and W. A. Slater of the U.S. Bureau of Standards. From this paper the following extracts are taken:

Idea Behind the Method

The inundation method proposed is based upon the belief that one of the important causes of variability in the strength of concrete is the variation in the quantities of sand and water introduced into successive batches of concrete, even when care is exercised in the measurements. Sand when measured by volume in either a loose or a compacted condition may show great variation in volume for a given weight of sand, depending upon the quantity of moisture in the sand. In one case the volume of the sand when moist was found to be 49.7 per cent greater than the volume of the same quantity of the same sand when dry. A concrete using that sand and designed to be mixed in the proportions of 1, 2 and 4 of dry materials would in reality be mixed in the proportions 1, 1 1/3 and 4 if the sand were measured in a moist condition as that reported in the paper referred to. Although the figures given indicate a richer mix when the sand is used in a moist condition no advantage in strength is derived therefrom unless the quantity of water used in the batch is reduced for the richer mix. On the contrary, the probability is that if the same quantity of water per batch is added for the moist sand as for the dry sand the increase in the ratio of the water to the cement (due to the moisture content of the sand) will result in a decrease in the strength of approximately 15 per cent. At the same time the cost of the cement for a cu. yd. of concrete will be increased by about 15 per cent, perhaps 65 cents per cu. yd. of concrete with cement at $3.00 per barrel.

The above illustration shows that with the usual methods of measurement the proportions obtained, the cost, and the strength, may depend considerably upon the amount of moisture in the sand, but the conditions assumed are extreme and the effect of varying moisture in the sand probably will generally be less than that indicated in the illustration used.

Preliminary tests by R. L. Bertin reported before the 1922 meeting of the American Society for Testing Materials indicated that the quantities of sand and water contained in a vessel of a given size are very nearly the same for all degrees of moisture in the sand provided that the sand is placed by pouring it into water in the vessel instead of placing it in a vessel containing no water. This being true it suggests a simple method of overcoming the great variability in the proportioning of concrete introduced by the variations in the unit volume of sand when the water content is not constant. It was primarily to investigate this phenomenon and its applicability to the measurement of sand for the making of concrete that the tests were undertaken.

In considering the applicability of inundation methods of measuring sand, to the making of concrete it should be remembered that such accidental variations in the gradation of the sand as may occur in the field were eliminated in these tests. Other features of the laboratory tests also may not be duplicated in the field. It does not seem likely that such accidental variations need be important but only field application of the method can determine as to its practicability. The following paragraphs summarize the results of the investigation.

(1) The results of the tests indicate that when sand is measured in water the quantity of sand per unit of volume is almost constant regardless of the original water content of the sand and that the water filling the voids in the sand is also nearly constant for any given method of placing the sand.

(2) The shoveling of the sand into the water gave more nearly constant quantities of sand and of water per unit of volume than any of the other methods used.

(3) The screening method gave slightly larger quantities of sand and slightly smaller quantities of water per unit volume than did the shoveling method and the results of the tests indicate a lower percentage of air voids for this method of placing the sand than for either the shoveling or the rodding methods.

(4) The rodding of the sand in water gave a larger quantity of sand per unit of volume than any of the other methods used.

(5) Placing the dry sand and the wet sand according to the A. S. T. M. standard C29-21 gave quantities of sand per unit of volume slightly less than when the sand was rodded after shoveling it into the water. The quantity of sand obtained when moist sand was rodded in air was much less than when it was rodded in water.

(6) The inundation method of measurement when used with a predetermined apparent specific gravity may afford a convenient means of determining the proportion of sand to other concrete materials even for jobs on which the materials are being measured by other than the inundation method.

(7) The variation in surface water per cu. ft. of coarse aggregate was approximately proportional to the variation in the fineness modulus of the coarse aggregate. The quantity of surface water was considerably greater for the crushed trap rock than for the quartz pebbles. The quantity of surface water averaged about 9 per cent of the total water used in the concretes of these tests or about 8 per cent by volume of the cement. The quantity of absorbed water per cu. ft. was greater for the quartz pebbles than for the crushed trap and was independent of the fineness modulus.

(8) For concretes made with quartz sand measured in water the strengths were nearly the same regardless of the condition of the sand, the method of placing it, and the proportion of fine aggregate to coarse aggregate.

The indication is that the measurement of sand by inundation methods should be of assistance in reducing variability of strength of concrete caused by variations in quantities of sand and water in a batch.

(9) The use of a constant fineness modulus of the mixed aggregate did not result in a constant slump or flow for the concrete. The variation in each was approximately proportional to the variation in the fineness modulus of the fine aggregate in the mix.

(10) The weight of the concrete per cu. ft. and the volume yield of concrete per barrel of cement were practically constant.

Fire Tests Concrete Poured in Winter Time

Terminal Structure, Constructed in Temperatures Varying from 20 Degrees Above Zero to 20 Below, Attacked by Severe Fire—Concrete Poured in Cold Weather Stands Up During Test

By ARTHUR R. LORD

A paper read before the American Concrete Institute

The McDougal Terminal is a large reinforced concrete and steel structure with brick curtain walls, now under construction on the lake front at Duluth, and it is designed to facilitate the shipping of perishable and other commodities to the East via the all-winter route. The work on the McDougal terminal was carried forward regardless of temperature, with precautions deemed suitable to the conditions at any particular time. The only real occasion for postponing work, in the opinion of Jacobson Bros., contractors for this terminal, was a good snow storm which makes the job "blind." Necessity breeds enterprise in such matters, for Duluth would have an unduly short building season with all the weather below 15° left out. Accordingly the construction of this building went on with temperatures at times of depositing concrete all the way from 20° above to 20° below zero. A very high rate of progress was also maintained. In one part of the building four floor levels were placed within 2½ weeks, the last being placed on the morning of the fire. In general no loss in time was involved in this building as compared with summer work. In a building constructed under these severe conditions and where the greatest precautions as to removal of forms would be in order, came a fire which substantially consumed 200,000 sq. ft. of form work! The only concrete to fall was that poured the same day. This fire constitutes one of the most thorough tests of winter concreting which has come to the writer's attention

The Nature of the Fire

The terminal is a 6-story structure, 128 ft. wide above the third floor and 172 ft wide below, extending some 490 ft. into the lake at present, with provisions for future extension. Work was being pushed as rapidly as possible. The structural steel work spanning the wagon docks and the railroad tracks in the first story was completed but not fireproofed. The reinforced concrete flat slab floors and roof would have been completed by Jan. 15. At the time of the fire all of the fifth floor was poured and some 108 ft. of the sixth floor at the south (Lake Superior end). Form work and reinforcing steel were in place for another large section of the sixth floor and form work for 108 ft. of roof.

Some 400 workmen were employed. On Thursday, Jan 4, 1923, they quit work as usual at 5 o'clock. At about 5:15 p.m. one of the night watchmen approaching the building saw a small flare in the fourth storey and ran to the office. The superintendent and a foreman hurriedly left the office and proceeded to the fourth storey to extinguish the blaze. When they reached the floor the blaze was still confined to a single small area some 150 ft. from the ladder. However, before they could reach it, the blaze suddenly spread with incredible rapidity and the two men were overtaken by and had to pass through the fire to reach the ladder and safety. When they reached the ground and turned in an alarm at 5:20 the entire fourth storey was a sheet of flame.

The fourth and fifth stories of the building were enclosed in canvas and heated by salamanders. These salamanders had been charged with anthracite coal for the night just a short time previous to the discovery of the fire. An explanation offered for the rapid spread of the fire is that the upper part of the fourth storey was heavily charged with gas from the salamanders and spread the flames throughout the length of the building.

The fire apparatus responded promptly but was delayed by the removal of railway cars from the tracks in and beside the building, and the hose lines were very long. The form work in the sixth, fifth and fourth stories burned practically without check and was substantially consumed. In general, the column and drop forms had been removed and the surface of these members received the full heat of the fire.

The Effect of the Fire

Many of the posts fell, some of the joists either fell or were supported precariously on one or two charred posts. This form work offered little by way of support to the slab.

Some of the form work, by reason of "freaks" in the fire or wind, came through in unexpectedly good shape. A strip of roof forms along the east edge at at the south end and about 15 ft. wide was almost intact although the balance of this form work was completely consumed and little if any water reached it. Some runways two stories high for pouring the roof also escaped with minor damage. The 140 ft. high tower was protected successfully by the fire department, as was also the mixing and distributing plant.

The fire, starting in the fourth storey and involving that entire storey within a few minutes, spread rapidly to the fifth and sixth stories above. Form work was in place for the sixth floor at the north end and the reinforcing steel was practically ready for the concrete. All this work was completely consumed and the steel dropped and tangled. The steel also underwent an annealing process losing much of the stiffness of hard grade material, so it could be bent as easily as structural grade. The spirals and column verticals were largely protected by the metal forms but the light wire spirals of this storey were so badly twisted and deformed as to be almost useless. At the south end the sixth floor had been placed five days before and its supports were entirely consumed as was the form work for the roof except for the "freak" noted above. The slab came through this severe test with little more than surface damage.

The fire also dropped from the fourth to the first storey but in the first and second stories and to a less extent in the third storey it was checked by the fire department. Most of the form work in the first and second stories had been removed and used above. In the northwest corner however, it was in place in all stories. Here some structural steel was in place and not yet fireproofed and it was most fortunate that it had water in time to save it. The very small damage to the surface of the surrounding concrete shows that the fire made little heat here, although it burned for some time.

Granite Pebbles Cause Damage

The principal damage to the McDougall terminal was due to the presence in the aggregate of large quantities of granite pebbles which "pop" when subjected to sudden intense change in temperature. Everywhere that spalling occured the surface presents heat-fractured pebbles. Where the form work was entirely consumed the surface of columns and drops, which were exposed for the entire length of the fire, is composed largely of such fractured pebbles. The quartz present in these pebbles was so finely divided as to be scarcely recognizable and the presence of iron further disguised the material. It is doubtful if the average engineer would have classified much of this material as granite although certain pebbles are readily identified. Where the form work was in place the fire ate its way to the concrete at the cracks between boards or directly over the joists where the extra material made a hotter fire and in such places incipient spalling, commonly very shallow, is general.

In a fire of this limited duration the square columns stood as well as the round; in both shapes the damage was a surface damage almost entirely. This showing may have been due also to the fact that the square columns were at the exterior walls of the building where the fire was undoubtedly somewhat less intense. The deepest spalling uncovered some of the slab reinforcing steel, principally in the direct bands which were from one-half to one inch above the forms. The amount of spalling indicates that temperatures considerable in excess of 1,070° F. (at which quartz pops) existed over large areas in this fire.

Some of the panels poured the same day fell when the forms were removed and some actually stood up. Out of 16 panels placed that morning 12 fell. All the columns remained standing except two and all the exterior columns were inclined slightly inward and have been removed and replaced. The flat slab of the fourth floor directly below came through without injury while two rather deep spandrel beams broke under the impact and have been torn out and replaced. This floor was five days old. Some fourth storey columns on the west face were cracked by the early removal of the slab forms by the fire and will be replaced with new ones. Careful examination failed to show any cracks in the slabs in any part of the building outside the small area that was poured that day.

Method of Concreting

In view of the excellent behavior of this concrete structure under fire test it may be of interest to describe briefly the manner in which concreting was carried on at this job with a temperature ranging to 20° below zero.

The precautions were less, rather than more, than commonly required. Most specifications require the storey above the slab just placed as well as the storey below to be enclosed, but in this case the storey above had no canvas protection or salamanders.

The materials, both sand and gravel, were heated by means of steam jets in the piles and also in the bins over the mixer, keeping them free from snow and ice and raising them to a temperature of 70° F. finally. Concrete was spouted to a hopper and crated to its final position in the forms. It was quite wet. The storey below was enclosed in canvas and the salamanders fired a couple of hours before concreting began.

The top surface of the freshly deposited concrete was not protected and presumably froze, but as soon as men could walk on it a layer of sawdust and shaving some 4 in. thick was spread over it. In a half hour or less the slab was warmed through again and the top became decidedly warm to the hand. The floor finish was not placed with the slab but will be placed after the building is fully enclosed and heated. While this method departs from usual practice in several respects the "acid test" of fire seems to have demonstrated its effectiveness under extreme conditions. Workmen removing the concrete which fell and that had been heated only for a part of one day, found it very hard to break with bull-points and sledges.

What the Fire Teaches

The fire teaches us some lessons that may be valuable in our education as engineers. In Duluth all available tggregates for concrete work contain large amounts of stone which spall or pop under sudden heat or when suddenly cooled as by a stream of water in a fire. Other cities frequently present a choice and this choice is frequently ignored. A slightly greater price for non-spalling aggregate would seem to be good insurance. This has long been recognized as a result of extensive laboratory tests and experience in other fires—but we forget.

This fire shows also that concreting can be succesfully carried on in extremely low temperature without loss of speed or undue increase in cost. At least 200,000 sq. ft. of this structure received a searching fire test which would surely have brought down any frozen concrete in its path.

Even with concrete made from decidedly fire-spalling aggregate the loss of value and time in a severe fire is exceedingly small as compared with that which results from a similar fire in a non-fireproof steel framed building. The total delay in this construction will hardly exceed two weeks. It should not be overlooked, however, that winter concreting as now carried on does involve a largely increased fire risk which must be fully covered by insurance.

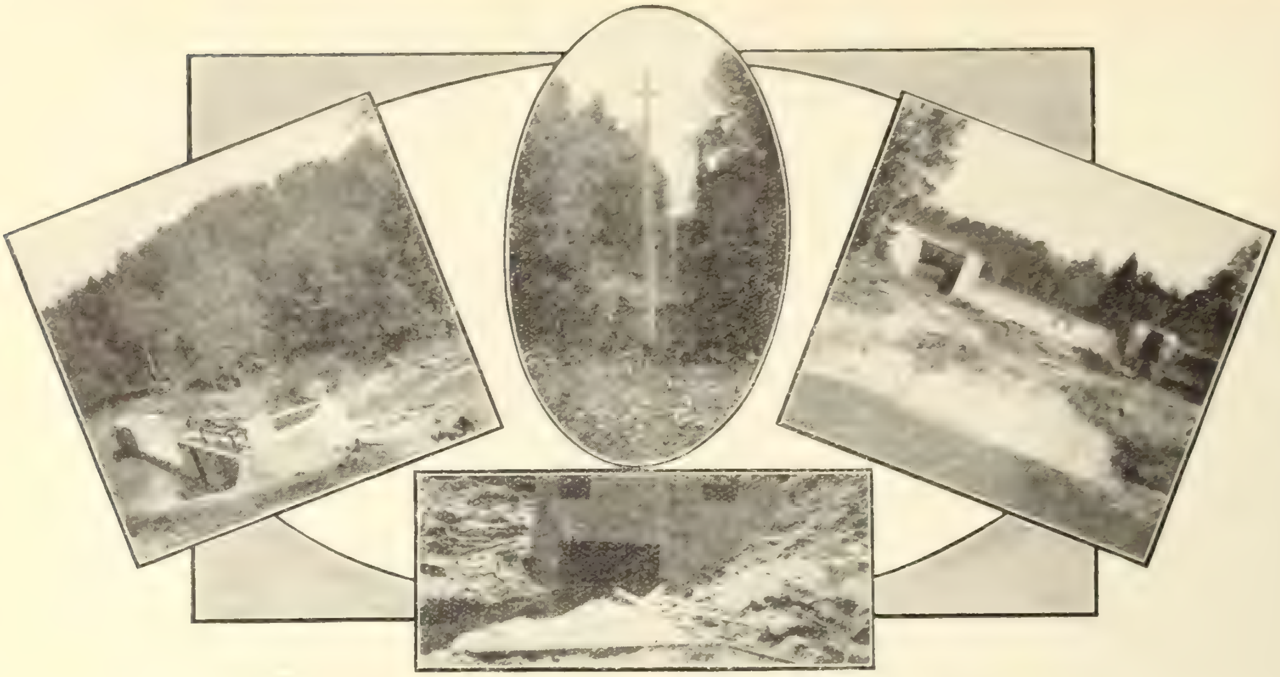
The superintendence and inspection work on this terminal was carried out under the direction of the architect S. Scott Joy, of Chicago. The structural design was made by the writer's firm in accordance with the Duluth and Chicago building codes.

Trade Incorporations

Standard Builders, Ltd., with head office at Toronto, capital $40,000, to carry on the business of building and wrecking contractors.

W. R. Worthington Contracting Co. Ltd., with head office at Toronto, capital $40,000, to carry on the business of contracting and engineering.

Messrs. Laurin & Leitch, general contractors, of Montreal, have reorganized as a limited company, the firm name now being, Laurin, Leitch & Co. Ltd., with a capital of $50,000 and head office at Montreal.



View of dam, power line and power house of Hydro-electric plant at Rockland

Hydro-Electric Plant Replaces Steam

Blanche River Supplies Power to Rockland, Ontario—Development Includes 900 ft. Pipe Line—Time Switch Control of Street Lights

The town of Rockland, Ont., was isolated from any source of electrical energy, the nearest being Ottawa, about thirty miles away. It was formerly supplied by a small steam plant operated by W. C. Edwards Co., giving a five hour service only, from 6 p.m. to 11 p.m.

This state of affairs led to the formation of a company with J. F. Simard as manager, to develop water power on the Blanche River, on the Quebec side of the Ottawa river, to supply the electrical energy required.

Ground was broken for the new development on June 1st. 1922, and the first unit was in operation on Nov. 20th, 1922. The development consisted of damming the river at Crooked Chute, building a five foot continuous stave pipe to the last fall on the river, called Millers Falls, and building a power house at the foot of Millers Falls.

The dam is of the reinforced concrete type, and built on a solid rock foundation. The water intake is built into the dam. The intake rack is made of B. C. fir treated with preservative.

The wood stave pipe line is nine hundred feet long and at one place crosses the river, twenty-one feet above the bed, on a concrete and steel bridge. The line also passes through 300 feet of rock and 400 feet of earth cut. The grade in the first 500 feet of pipe is 2 in 100.

Approximately 400 yards of rock had to be excavated for the wheel pits and tail race. The power house is built of reinforced concrete and measures thirty feet by thirty-one feet inside.

The present equipment consists of the following:-

One Boving single runner horizontal wheel rated at 400 h.p. under 60 foot head at 600 r.p.m. This is direct-connected to one Canadian General Electric Co. 250 kv.a., 3 phase, 6,600 volt generator with direct-connected exciter. A 3,600 lb. flywheel is attached to the shaft between the coupling halves. A Woodward governor controls the unit. Provision is made to install a 600 h.p. unit in the future.

The transmission line is 35 foot cedar poles, butts treated, spaced 150 feet apart with 30 in, triangular spacing. Wooden treated cross arms, and steel side top pins, with Canadian Porcelain Insulators are used. The transmission line runs to the north shore of the Ottawa River opposite the town of Rockland, and the river is crossed with a submarine cable. A metering station is installed at Rockland and ,in the village of Thurso, Quebec.

The distribution in the village is all 3 wire in groups. The street lighting is series 6.6 amp. controlled by automatic time switches.

The complete equipment and construction was carried out by the Marchand Electric Co., of Ottawa, under the supervision of G. C. Marchand for the transmission lines, distribution and cable work, and E. F. Marchand for the hydraulic and power house construction.

Montreal Chosen for A.S.M.E. Meeting

The spring meeting of the American Society of Mechanical Engineers will be held in Montreal, on May 28 to 31. It will be preceded by a trip which will start at Buffalo, N. Y., on the 26th, and visits will be made to points of interest to engineers en route to Montreal. Following the meeting there will be excursions to Quebec and points north and east of Montreal.

Construction Developments During the Month of March

Figures Compiled by MacLean Building Reports, Ltd., Show Trend of Building Activities for Last Month—Details of Contracts Awarded in Eastern and Western Canada

Construction Contracts Awarded in Eastern Canada, March, 1923

	Ontario		Quebec		New Brunswick		Nova Scotia		Eastern Total	
	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value
Apartments	6	$ 165,500	1	$ 18,000	1	$ 3,500	....	....	8	$ 187,000
Churches	3	185,000	3	220,000	....	....	....	....	6	405,000
Factories	13	282,500	9	761,000	1	35,000	1	10,000	24	1,088,500
Public Garages	8	58,500	5	53,000	....	....	....	....	13	111,500
Hotels and Clubs	5	141,000	2	95,000	....	....	....	....	7	236,000
Office Buildings	9	208,500	4	3,019,500	....	....	....	....	13	3,228,000
Public Buildings	9	246,200	1	125,000	....	....	....	....	10	371,200
Residences	855	4,564,100	180	760,500	3	10,200	2	5,500	1041	5,345,300
Schools	8	403,500	5	1,025,000	....	....	....	....	13	1,428,500
Stores	30	339,000	15	687,500	1	5,000	1	8,000	47	1,039,500
Theatres	....	....	....	....	1	19,000	....	....	1	19,000
Warehouses	2	23,500	3	14,000	....	....	....	....	5	37,500
Total Buildings	948	$6,617,300	228	$6,778,500	7	$72,700	4	$23,500	1188	$13,497,000
Bridges	1	8,800	1	10,000	3	5,800	....	....	5	24,600
Dams and Wharves	1	3,700	2	1,009,300	....	....	....	....	3	1,013,000
Sewers & Watermains	10	287,200	1	20,000	....	....	....	....	11	307,200
Roads and Streets	18	410,000	13	389,200	1	5,000	....	....	32	804,200
General Engineering	1	15,000	1	98,600	....	....	....	....	2	113,600
Grand Total	979	$7,342,000	246	$8,305,600	11	$83,500	4	$23,500	1241	$15,759,600

Construction Contracts Awarded in Western Canada, March, 1923

	British Columbia		Alberta		Saskatchewan		Manitoba		Western Total	
	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value
Churches	1	$ 15,000	....	$...........	....	$...........	....	$...........	1	$ 15,000
Factories	....	....	....	....	....	....	2	2,754,500	2	2,754,500
Public Garages	4	39,700	....	....	....	....	....	....	4	39,700
Office Buildings	2	32,200	....	....	1	40,000	1	1,200	4	73,400
Public Buildings	....	....	....	....	1	150,000	3	40,000	4	190,000
Residences	66	282,300	5	11,000	9	35,600	28	113,000	108	441,900
Schools	....	....	2	11,000	1	16,000	....	....	3	27,000
Stores	16	129,300	3	17,500	....	....	1	7,000	20	153,800
Theatres	2	6,600	....	....	....	....	....	....	2	6,600
Warehouses	2	70,000	3	62,600	2	52,000	....	....	7	184,600
Total Buildings	93	$575,100	13	$102,100	14	$293,600	35	$2,915,700	155	$3,886,500
Dams and Wharves	1	$ 7,500	....	$...........	....	$...........	....	$...........	1	$ 7,500
General Engineering	1	51,200	....	....	....	....	1	250,000	2	301,200
Grand Total	95	$633,800	13	$102,100	14	$293,600	36	$3,165,700	158	$4,195,200

The Mechanics of the Activated Sludge Process of Sewage Treatment

Advantages of the Method and the Widespread Recognition of its Merits —Agitation Schemes—Diffused Air as a Means of Circulation Gives Best Results

By J. A. COOMBS*

In present day methods of sewage purification two distinct processes have been adopted. In the first process the sewage, usually after preiminary settlement, is subjected to the action of anaerobic bacteria: by these the organic matter is broken down to simpler bodies, with the evolution of gases and the production of bodies of objectionable odors. The sludge produced has only a small fertilising value as some of the nitrogen is lost by the fermentation and a good deal remains in a combined form in the final effluent. In the second process the liquor is treated by aerobic bacteria in filter beds.

The activated sludge process is a single process, in which the whole of the organic matter is purified, together with the liquid under aerobic conditions. The final effluent passes away in a highly purified state in reference to both colloidal and bacterial contamination. The resultant sludge having a high moisture content and retaining most of the nitrogen in the original suspended matters and flocculated colloids is suitable for use as a liquid fertilizer.

It has been said that the sewage disposal problem is the sludge problem. By the activated sludge process the whole of the organic matter is changed into a fertilizer free from all nuisance and having a commercial value; thus it becomes the first satisfactory solution of the great sewage disposal problem in cases where the surplus sludge can be utilized on suitable land for irrigation either directly or after preliminary dewatering on drying beds.

The activated sludge process is in two stages. The first stage is the production of the most suitable environment for the cultivation of bacteria by the introduction of air into the sewage contained in open tanks, which bacteria cause the activated sludge to maintain its activity and enable it to coagulate the colloidal matter in the crude sewage. The second stage is the production of a quiescent state which allows the coagulated matter to precipitate along with the suspended matter, leaving the supernatant water fully purified.

The work of the mechanical engineer has been to design the most suitable tanks and apparatus for producing these conditions so that the crude sewage can be treated in a continuous flow, just as it reaches the sewage disposal works.

Method of Artificial Aeration

There were three primary methods of aeration open to the pioneers as follows:—

(1) Atomising sewage in the atmosphere.
(2) Intensifying the method of stream purification.
(3) Atomising air in the sewage,

and, of course, combinations of these.

As the bacteria take their oxygen from the dissolved oxygen in the sewage, also as water with complete saturation can only hold one part of oxygen per 100,000 parts, and as water globules dropping through the air become only partly saturated, therefore a normal sewage with an oxygen absorption of ten parts per 100,000 by a four hours' test would require the sewage to be atomised many times before it could become sufficiently purified. This method was therefore discarded.

In considering purification in a stream of rapid flow, the opinion was formed that the aeration was largely due to the air bubbles induced at the broken surface caused by eddying, and not so much to the surface contact with the atmosphere. It is interesting to note that subsequent experiments with mechanical agitation have proved this opinion to be correct.

A means of mechanical agitation has been finally evolved which gives a maximum breaking of the surface, thus introducing the maximum volume of air in small bubbles which can be secured without the use of air previously compressed. The sewage flows through long channels. A rapid circulation is effected at right angles to the flow of sewage through the channel, thus the combined circular motion and the flow of sewage produce a spiral flow. It is found that this method of circulation by special form of paddles introduces innumberable air bubbles: these are collected below the horizontal baffle, whence they pass to atmosphere through an air trap.

Mechanical Circulation

At Birmingham, with an endless channel tank, a good circulation was obtained by means of a screw propeller entirely submerged, but as the surface of the liquid was not broken the arrangement did not give sufficient aeration to prevent septic action. On raising the propeller so that it was only partly submerged, a very broken surface was obtained which produced a marked improvement. Experiments in glass tanks showed that any circulation set up by mechanical means introduced air bubbles in very large quantities, and that all mechanical methods of agitation depended for their efficiency more upon the surface of the air bubbles than upon the atmospheric surface.

For the above reasons the first method was deliberately discarded, and it was decided to adopt a combination of second and third methods—i.e., a method of steam purification intensified by the forcing of compressed air through porous material at the bottom of preferably fairly deep channels, through which the sewage was pumped or allowed to flow by gravity.

Eventually a porous tile was produced which, when submerged in water, would pass 2 cub. ft. of free air per minute per sq. ft. of surface, with 3 in. of water head producing bubbles of less than 1/8 in.

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*Extracts from paper presented at a meeting of the Institution of Sanitary Engineers.

dia. The diffuser as now generally adopted consists of the porous tile set in a shallow cast-iron box of which it forms a cover, this box providing an air chest which can be connected to an air supply. These tiles can, of course, be used without cast-iron boxes by cementing them over gutters in the aeration tank floors, a procedure formerly adopted in the United States, but since discarded.

Further experiments in glass tanks had been undertaken to find the best method of producing a circulation, and it was found that rows of diffusers spaced apart gave a maximum circulation with the minimum volume of air and the minimum of conflicting eddies. From the first a spiral flow with a self-draining bottom tank was aimed at, but the difficulty of preventing short circuiting was seen, and it was decided to adopt rows of diffusers arranged transversely to the flow with a bottom of ridge and furrow section, the diffusers being placed at the bottom of the furrows.

The following conclusions were reached as the result of experience gained at Stamford, Worcester and Baguley: —

(1) That the activated sludge process was proved successful on a large scale.

(2) That the best type of tank was the "once through" type as at Stamford.

Up to this time more consideration had been given to the "endless channel" tanks than to the "once through" or Stamford type. The former type, however, developed the following disadvantages:—

(a) Owing to the great length of channel required it was the more costly type.

(b) Owing to short circuiting a much longer period of aeration was required, increasing the horse power, as compared with the "once through" type.

Diffused Air as a Means of Circulation

Having demonstrated the best form of tank, it was at this stage decided to make a large tank with glass sides, for the better observation of the effects of using diffused air as a means of circulation. Small glass tanks and large glass tubes had been used from the first in the experiments with the diffusers, but these were too small to give any reliable data as to the volume of air required to give definite velocities of circulation.

Consequently, a tank with four sides of plate glass measuring 6 ft. long by 2 ft. 6 in. wide, with a depth of liquid of 3 ft., was made and from the experiments made the following facts were established:—

(a) That the velocity of circulation was proportional to the square root of the volume of air injected.

(b) That the velocity of circulation was not affected appreciably by the width of the diffusers, hence the area of diffusers did not affect the velocity of circulation.

(c) That the velocity of circulation for a given volume of air used was proportional to the wetted surface of the tank.

(d) That direction baffles necessitated (due to the increased wetted surface) a greater volume of air to give a definite velocity of circulation.

(e) That rounded corners at root of walls were an improvement, as they reduced the wetted surface and prevented the deposit of heavy materials which might form the nucleus for further deposits.

(f) That the best position for diffusers was a longitudinal row arranged at the foot of one wall, thus giving the tank contents a spiral motion.

Meanwhile, experiments in parallel with the foregoing were made to find the best arrangements of air feed pipe connections and the best form and dimensions of diffuser. These had been made, varying in length from a few inches to 4 ft. 6 in. in length and from 1 in. to 24 in. in width. These were tried in the glass tank, and finally the present form was approved and standardized.

Mechanical Agitation

Advantage was taken of the large glass tank to test mechanical agitation and many other methods of introducing air into the tank contents.

The description of the various methods tried would take a paper in itself. An independent set of experiments was conducted by a separate staff, as it was thought that fresh ideas would be introduced. The result of these experiments not only confirmed the value of the diffuser as an aerator and circulator, but that it is possible to get a fair result by the use of mechanical paddles or propellers.

The conclusions from these experiments were that paddles or fans give maximum ruffling of surface, induce the largest number of air bubbles, and produce a given circulation with a minimum of power if fixed with their axles horizontal and above the water level in the tank.

The following comparisons were arrived at from experiments and trial designs:—

(1) That whereas in the largest plants with many units aeration and circulation can be produced by a single compressor operated direct from prime mover and by suitable adjustments, the amount of the agitation can be varied in successive portions of the tank to suit the degree of emulsification of the fresh sewage. On the other hand, with a similar plant operated by paddles or other machinery many independent sets must be used, and these necessitate mechanical transmission of power which increases the total h.p. considerably.

(2) That if the diffused air system is used then tanks can be designed for the average flow, and the maximum flow can be treated by a temporary increase in the volume of air used. If, however, mechanical agitation is adopted the tank must be designed for greatest flow of the strongest sewage or the worst conditions and this plant kept in operation with all flows, hence with compressed air smaller tanks can be used than with mechanical agitation, and it gives a better mastery in times of increased strength or flow of sewage, as the volume of compressed air used can be increased to suit the character and volume of sewage passing through the tanks.

(3) For the return of sludge the air lift is the best form of pump. Also for filling tanks with effluent in order to force out sludge before putting a unit out of operation air lifts are the most suitable means; and as these air lifts can be operated by air from aeration mains the design is simplified by the general use of compressed air.

(4) If reaeration is adopted then the use of compressed air is essential.

Recognition of the Value of the Activated Sludge System

Having established the best form of diffuser and the best form of tank, attention was now given to designing the best lay-out of tank to deal with variable strengths and flows in dry weather, wet weather and flushes of trades waste and five types were evolved. In all these five types there is a minimum length of distributing channels containing sludge, and pumping for the purpose of emptying any unit is reduced to a minimum.

In spite of the conservative attitude on the part of many of the municipal authorities in this country, with notable exceptions, the activated sludge process has revolutionized the process of sewage treatment, as is shown by the following:—

(a) The attitude of the British Ministry of Health is to advise the consideration of the process where the local conditions are suitable.

(b) In Ontario, Canada, the public health authority insists on the adoption of the activated sludge process, and good reasons must be given before they allow an authority to adopt any other system.

(c) The city of Milwaukee is installing a plant to treat 85,000,000 gallons of dry-weather sewage per day, and a plant to treat sewage from a population of 800,000 has been approved for the sanitary district of Chicago.

The use of compressed air on the diffused air system has been adopted in all American plants both in the United States and in Canada.

Horse-Power

The last factor the writer would mention is the b.h.p. required; this, of course, depends upon the pressure and the volume of compressed air used for aeration and the return of sludge.

Depth of liquid over diffusers in feet	2½	5	7½	10	15	20	25
Cubic feet of free air per minute per million gals. treated per 24 hours	1848	924	616	462	308	231	185
i.h.p. per million gallons per 24 hours	18.48	12.9	10.66	9.7	8.6	8.1	7.8

For 20-h.p. and upwards 50 per cent should be added to the above figures of h.p. to obtain the b.h.p. required to compress the volumes of air given. With fourteen factors to be taken into account, with no two factors alike in any two plants, it is impossible to compare the results on basis of h.p. alone.

The actual volumes used in English practice in tanks 6 ft. deep are from 1 cub. ft. per gallon treating a weak crude sewage having an oxygen absorbed figure of, say, 4 parts per 100,000, to 1½ cub. ft. per gallon treating a strong crude sewage having 12 parts of oxygen absorbed per 100,000 parts, the stay in aeration tank being proportional to the strength of sewage. For a tank liquor from a preliminary settlement tank considerably less than above volumes of air are required.

The accompanying table gives the theoretical h.p. per 1,000,000 gallons treated per twenty-four hours, when 1 cub. ft. of free air per gallon is used, with a depth of tank of 6 ft., also the corresponding h.p. for other depths of tanks, assuming volume of air per gallon varies inversely as depth of liquid.

In view of the great difference in the h.p. required when treating crude sewage with all its organic matter retained, and that required for a sewage freed as much as possible from organic matter by preliminary settlement, it is purely absurd to attempt to compare the h.p. used with compressed air treating crude sewage, with the h.p. used with mechanical agitation when treating settled sewage; yet the writer has seen several such comparisons in papers read before scientific associations.

Better Results From the Diffused Air Method

If proper values are given to the fourteen factors mentioned it will be found that the diffused air method gives much better results for a given b.h.p. than can be obtained by any mechanical method of aeration, and it would be absurd to expect that the metal surfaces of propellers or paddles would give as good results as the air surface of bubbles for the purpose of aeration.

Messrs. Jones and Attwood, Limited, have employed compressed air to mix lime and water to obtain milk of lime and for other purposes when the mixing of a liquid was required, and proved that it has an extremely high efficiency for such purposes. This high efficiency is due to the fact that a mechanical efficiency of 75 per cent can be obtained in compressing the air, and that the compressed air expands isothermally when producing circulation. There is therefore every reason to conclude that injected air must prove equally efficient for the purpose of circulating sewage and activated sludge, especially if the spiral flow type of tank is adopted. The air pressures used, even with a depth of liquid of 24 ft., are so low that the thermal losses, the usual bugbear of pneumatic power, are negligible. The theoretic h.p.s in table already given include these thermal losses in compression.

Purification is completely under control when the diffused air method is employed, and abnormal flushes of organic matter or inhibitive trade waste can be dealt with by increasing the air supply in a single unit plant, or by bringing standby units into operation where these are provided, which should be the case in all large schemes.

Advantages of the Process

In case of schemes for populations under 10,000, where cheap power is available, whether electric, gas or water power, or where pumping at sewage works is necessary in any such case, then the compressed air method of the activated sludge process is the cheapest method of sewage disposal. This applies to a large country house or institution where power is used for other purposes. Pumping can often be saved by the adoption of an activated sludge plant. Owing to the process being without smell or other aerial nuisance, the installation can be placed close to a house, thus considerable saving in outfall sewer is obtained. It will thus be seen that the activated sludge process plant on the compressed air method is suitable for a small block of outlying cottages, country house, or institutions, or for a municipality with a population of millions.

The simplicity of the process by which the highest purification is obtained in such a small area without filtration or preliminary settlement is a very attractive one. In view of the fact that a most satisfactory plant can be put forward to suit any normal sewage, it is doubtful whether a local authority is justified in experimenting on lines which can only repeat over and over again what has already been proved or disproved.

In conclusion, many thousands of the most eminent sanitary engineers and scientists from all parts of the world have inspected the activated sludge plants in this country, and have watched the crude sewage enter the aeration tank in all its foulness, and have commented on the clear and sparkling nature of the final effluent as it flows away continuously from the settlement tank.

The paper will, however, have partly missed its object if it fails to impress the fact of the immense amount of time, labour, thought and money which have been expended in arriving at the latest designs, the result so simple that anyone inspecting the plants goes away thinking a child can copy them. But the writer would like to emphasize the fourteen factors, many of which can be sub-divided into several sub-factors.

Finally, the development of the process is a triumph of team work in which both chemists and engineers have worked in harmony.

How Can Wear on Roads be Reduced?

Economically it is Undesirable to Increase the Cost of Road Construction so as to Make Roads More Substantial, so that a Reduction of Wear Must be Sought by Altering Vehicle Design

By MAJOR T. G. TULLOCH*

The situation today is that everyone is agreed that road transportation for certain broad classes of goods and passengers is quicker, and, within certain limits of distance, cheaper than carriage by rail. Clearly, however, the effect on the wear and capacity of roads brought about by this new development was not at first fully appreciated, and even though it is but in its infancy, the cost of keeping roads in good condition, quite apart from the cost of making new roads and widening and improving old ones, has reached very large dimensions.

There is, unfortunately, little doubt that the heavy commercial motor vehicle is responsible for the major portion of the damage; indeed, it would not be far wrong to put it at 95 per cent, taking all things into consideration. Having regard to the fact that under the existing taxation regulations, as these vehicles pay only about 12 per cent of the repair bill, it is hardly surprising that ratepayers who find most of the balance to the extent of 75 per cent of the total, are beginning to agitate for a more equitable adjustment of the burden, more particularly those who gain neither profit nor (to them) apparent advantage from road transportation, even though it may be argued that indirectly they do benefit to some extent. It would be difficult to prove to them, however, that they derive advantages in the proposition of 75 to 12, and to disabuse their minds of the impression that they are in point of fact subsidizing the owners of the vehicles which are mainly responsible for the damage for which the ratepayers have to find the greater proportion of the repair bill for roads.

The motor owners naturally say: "If the roads were made better and stronger and more resistant, they would not require repairing so often." This is certainly an argument, but a one-sided one, as the capital cost involved in making roads which could not be damaged by existing lorries would be so stupendous that the interest charges and sinking fund or amortisation charges would probably outweigh the advantages so gained.

The fact is, that even today, we have arrived at the economic limits of cost of road construction and repair, and unless some radical means of coping with the problem is adopted at an early date, the situation in a comparatively very short time will probably become so acute as to lead to drastic legislation which will stifle progress, to the detriment of the advantages conferred by road transport and to the injury of a very large and important industry.

The two most potent factors of our social and industrial life are cheap power and cheap transportation, and if in the fulfilment of these a new factor arises—namely, increased cost of roads and increased taxation to cover it, which would stultify the benefits to be derived from otherwise cheap road transportation, the net results would be, no progress.

Causes of Road Wear and Destruction

Before proceeding further it might be as well to touch upon some of the causes which bring about road wear and destruction. Many theories have been put forward to account for a hitherto unexpected effect—namely, corrugations of roads, an effect which, until the advent of heavy and fast motor transport, had never made its presence felt. It has been suggested that in making roads with the use of road rollers, the surface material is pushed forward in front of the roller until it is sufficiently dense and resistant to stop further movement, when the roller then passes over a zone of high density and commences pushing forward the light density material just in front of it again to undergo a similar densifying process, and so on. The theory, however, does not seem to be sound, having regard to the fact that corrugations appear on stone sets, wood, and actually on railway lines, in none of which cases are rollers used. Another theory it that the corrugations are due to the periodicity of the springs, but here again no two such periodicities are alike except in any particular make of vehicle. Further, it is observed that the corrugations are not always the same distance apart.

We are forced, therefore to look to some other cause which is independent of these conditions, and the only solution appears to be in the vibration of the road itself. As the wave lengths will depend upon the nature of the materials used, both in the foundations and in the surface, and as these differ in various districts, this would account for the pitch of the corrugations being different. What happens is that as a vehicle passes over a road it causes it to vibrate; at the same time a partial vacuum is formed at the rear of the moving vehicle. The heavier the vehicle and the greater the speed the greater the amplitude of the road vibrations and the greater the vacuum effect. The scouring effect of eddy action is very great. In some experiments which the author carried out many years ago, he encountered an eddy action effect which actually cut through 1 in. of gun steel in a minute fraction of a second. In the case of roads, the air rushing in to fill up the partial vacuum behind the vehicles encounters the surface of the road already in a state of vibration and consequently in a state of what might be called potential corrugation. Eddies are formed at once in the troughs of the vibration waves, and their circular scouring action at once lifts out any particles of disintegrated or loose road material and disperses them into the atmosphere, and thus the beginning of a permanent corrugation is made. The air passing over the crest of the potential corrugation is a smooth action and has no tendency to circular eddy action. Hence, as a direct air current has nothing like the effect or force of an eddy, the crests are not worn to the same degree as the troughs.

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*Extracts from paper presented at meeting of Institution of Automobile Engineers.

It would be interesting to carry out an experiment with an instrument which would register road vibration in terms of time and wave length and then compare these results with the actual dimensions of the corrugations formed on the road. If they are in proportion, it would prove that corrugations are directly due to the vibration of the road itself.

The economics of road construction and maintenance demand less wear on the roads. The economics of road transportation, on the other hand, demands increased carrying capacities and speeds. These two demands would at first sight appear to be diametrically opposed, but fortunately there is a solution of the problem, and it is the alteration of the vehicle in the direction of increasing the number of driving and supporting wheels or surfaces on the lorry, where contact is made with the road, thus reducing the weight per square inch at each point of contact, which in turn will reduce the amplitude of the corresponding vibrations of the road itself, and the abrasive wear thereon due to the thrust being spread over a larger area, and so the destruction of the road itself.

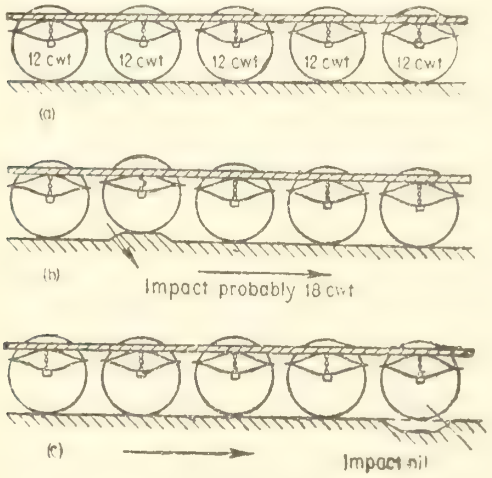

Fig. 1—(a) shows the de Mole proposal for tying back the springs on a five-axle chassis. (b) shows a wheel rising and travelling over a bump in the road. (c) shows wheel suspended, in its pasage over pot-hole, by chains, dashpots, etc.

A subsidiary help, so far as wheels are concerned, also exists in providing the points of contact with improved cushioning devices, such as pneumatic tires of sufficient size and strength to support the weights involved in heavy commercial vehicle work. This, however, is but a palliative, though an excellent one and should not be allowed to distract too much attention from the main solution of the problem, as it carries with it certain drawbacks as regard economy such as the high initial costs involved not only in the tires themselves but in the alteration of wheels, gearing, &c., and as regards safety, bearing in mind the high air pressures involved, which are of the order of 120 lb. per sq. in. Further, a puncture with very large pneumatic tires when used on the existing types of four-wheeled lorries involves considerable delays.

On the other hand, if pneumatic tires not of the giant type were used with a multi-wheeled lorry, such a combination would form, so far, in this country at any rate, the best all-round solution of the problems waiting to be solved which are embraced in most of the factors mentioned at the outset of the paper. The author uses the expression "so far" because sufficient evidence already exists to prove the superiority of the claims of multi-axle drive and pneumatic tires, both separately and combined, over the single-unit driving axles and solid tires.

The use of cushion tires gives a mid position between pneumatic and solid tires as regards road shocks, and from some points of view they offer advantages over pneumatic tires in their long life and absence of punctures and bursts.

Multi-Wheel System

The multi-wheel system is perhaps best eximplified in the De Mole eight or ten wheeled vehicle, as this seems so far to be the greatest step forward and embodies certain new features of a revolutionary character. Fig. 1 shows the principle—namely, the provision of a large number of comparatively light wheels the springs of which are prevented by chains or dashpot arrangements from expanding beyond the flexion imposed by the load whilst being open to further compression on encountering an obstacle. The result is that, in passing over a hole or depression in the road, the spring cannot shoot the wheel down into the hole, so that no damage is done to the road in the way of further enlargement of the hole by wheel pact on its further edge. At the same time, since the wheel is geared to the other wheels, it cannot spin freely whilst unsupported, so no damage is done to the tire when the level of the road is reached on the other side of the hole. On the other hand, in passing over a lump in the road, the spring, being lighter than in the ordinary type, will give easily without such a tendency to lift the whole chassis. Thus, the stresses to which the frame is subjected are considerably reduced, with consequently less tendency to wear and distortation, thus making for prolonged service and less damage through road shocks to the load carried. Further, the wheels and axles being of much lighter construction, the unsprung weights are very much less, the importance of which is well-known.

It would be unsound to dogmatize as to the extent to which the number of wheels can be multiplied in order to still further increase pay-loads and reduce damage to roads, until a fair number have been built and tried out in comparison, but certainly in principle the greater the number of wheels supporting a given load the less will be the wear on the road; consequently, pursuing this line of argument to its ultimate conclusion, a system which is tantamount to a very large number of wheels indeed, that is, a continuous track or roadless vehicle as exemplified in principle in the tank, should do practically no damage, and indeed would actually improve a soft road by its vertical pressure action, and should by reductio ad absur-

Modern Developments in Methods of Maintaining Concrete Pavements

Maintenance is Just as Essential for Concrete Roads as for Other Types but the Amount Required will Decrease as the Road is Built Better —New Ideas in Patching and Repairing

By LEROY C. SMITH
Engineer-manager, Board of County Road Commissioners, Wayne County, Mich.

Before the Michigan Conference on Highway Engineering

Concrete pavement, the same as any other roads or structures, needs maintenance, contrary to the claims of some who promoted roads in years gone by. It is usual to figure maintenance and depreciation of a building at the rate of 2 to 4 per cent annually, and in defense of the maintenance cost of pavements, especially concrete; I should like to record the fact that I have no knowledge of any concrete pavement costing a greater amount than that for its maintenance.

The better the road is built, the less maintenance charge there will be against it. Roads built ten years ago with a maximum thickness of six inches—before better practice had been established in the methods of constructing concrete pavements—are the ones that are today requiring the greatest expenditures for maintenance. In the early development of the concrete road insufficient allowance was made for the probable increase in traffic in our industrial districts, and the optimism of the public official and engineer was too great as to the sustaining strength of a concrete slab with a six inch maximum thickness.

Three-quarters of the maintenance activities on concrete pavements in any community are directly attributable to the above causes. Maintenance costs are also directly in proportion to the intensity of traffic and the weight of loads, and the roads which require the greatest amount of maintenance are those which have become inadequate both in thickness and width. Table I covers the maintenance costs for 1922 of cement-concrete pavements in Wayne County, Michigan.

Thoroughfares upon which we should have 60-foot pavements, lowered to city grades, with underdrainage, are still being maintained by us as 16 and 18-foot concrete roads, all of them being not more than six inches in thickness. These roads are now carrying traffic of from five to ten thousand vehicles per day. Such roads as this attract attention owing to the excessive cost of maintenance while in reality they are now a fair criterion of the proper cost of maintenance of concrete pavement. We are prone to forget the thousands of miles of concrete pavement which have been laid during the past ten years in sections where the industrial and traffic development has not been so great and where the road has proven adequate not only in thickness, but in width, and has given excellent service.

Features of Maintenance Not Included

In order to reduce this paper to the exact subject outlined in the title, we will exclude discussion of the many items of maintenance applicable to all types of road. The items I refer to are: Shoulders, many of which must be macadamized temporarily, the best results being with penetration macadam; ditches, which have to be maintained upon any road; guard-rail; culverts; cutting weeds; erecting and maintaining signs; snow removal; and roadside development, which in my opinion is one of the coming features in the cost of maintenance of any road system.

By eliminating the above, we reduce the discussion to the maintenance of the concrete pavement proper. This involves the tarring or asphalting of cracks and joints, and concrete patching where a considerable area of the pavement is broken down.

In the maintenance of concrete roads the old adage "A stitch in time saves nine" is applicable, and as usual, too many of us are making speeches about the importance of continuous, adequate and prompt maintenance, and after making the statements we return home and neglect the maintenance, sometimes by reason of the lack of funds to carry ou the program or through poor organization or dilatory methods in caring for the work.

It is my opinion that a great number of serious breaks in concrete pavements can be prevented by a thin application of tar and sand or, if the depression or abrasion is one-half inch deep, by the use of small granite chips, to mend the surface before heavy trucks have an opportunity to jar over the uneven places and by their impact shatter additional sections of concrete. The Bates road tests, with which you are all familiar, impress this point upon our minds: that where a sight break appears at a corner near the edge of a pavement, the failure of the pavement is rapid and progressive from that point.

Table I. Maintenance Costs for 1922 of Cement-Concrete Pavements for Various Roads in Wayne County, Michigan*

Name of Road	Length	Age Average of Sections	Cost of Tarring	Cost of Concrete Patching	Cost Per Mile	Average Traffic Per Day	Cost Per Vehicle Mile
Huron River Drive	25.5	8	$ 759.00	$ 1,016.00	$ 69.00	414	$ 0.00084
Warren Avenue	22.0	3	2,261.00	1,413.00	167.00	1,398	0.00060
Seven Mile Road	31.1	7	3,586.00	9,523.00	422.00	1,482	0.00140
Mack Avenue	7.5	6	284.00	673.00	127.00	2,040	0.00031
River Road	12.5	11	3,860.00	2,707.00	525.00	3,930	0.00067
Michigan Avenue	20.7	11	5,779.00	4,760.00	509.00	4,812	0.00052
Gratiot Avenue	4.3	7	1,136.00	849.00	462.00	5,200	0.00044

*Notes:—These figures are based on a 14-hour traffic count per day. Calculations are based upon a 200-day year. Cost per mile does not include maintenance of shoulders, ditches, guard rails and culverts.

Repairing Cracks and Joints

Three or four times a year it is necessary and desirable to distribute and apply small quantities of tar or asphalt in the cracks, joints and small abrasions in the surface of the pavement. The usual and old method of doing this work was to send out a few barrels of the bituminous materials and distribute them along the line of road in approximately the proper amounts to take care of the application which is expected to follow at an early date. Then what is known as a "tar gang," consisting of about half a dozen men, with a two-barrel tar kettle on wheels, come down the road, open up the barrels with difficulty, put the tar in the kettle, build a fire with the staves and some of the tar adhering to them and, after an hour or two, when they get the tar to what the foreman considers the proper heat, apply the material to the cracks and joints where needed. This method is expensive both in labor and material, involves the destruction of the barrels in which the tar was delivered and, worst of all, makes for delay and inefficiency in labor.

The above conditions must be the practice for any communities having but a small amount of concrete pavement to maintain. They are, however, being corrected where large mileages of concrete pavement must be maintained.

Central yards are being established in convenient locations to supply materials for maintaining 100 to 150 miles of concrete road. These yards are situated adjacent to railroad sidings, so that tar may be purchased in tank-car lots. From the tank-cars it is pumped, or blown by air, into elevated storage tanks of 15,000 gallons capacity. These tanks are provided with steam coils for heating the tar and are insulated so as to hold the heat. Five-ton motor trailers are provided which will hold from eight to ten barrels. The trailers are provided with kerosene heaters to keep the tar at the proper temperature during the entire day.

The work is so organized that a night watchman heats the tar, fills the trailers and prepares the equipment for use on the following day. In the morning, a tarring gang is able to start out from this central yard with a truckload of dry sand, granite chips and a 10-barrel trailer of hot tar, ready to go to work. It has been found that the equipment as outlined is of about the right capacity to supply a tarring crew of six men for a day.

Cone-shaped distributors are more economical of material than the old-fashioned pouring pot with a fan-shaped nozzle. They are also far more easy to operate in windy weather.

Advantages and economies of the above methods of tar distribution are apparent. The cost of the barrels, amounting to four to five cents per gallon, is immediately eliminated. The cost of handling and filling is eliminated for the producer of the bituminous material. This, of course, is reflected in the price paid for the product. Considerable saving is made in the cost of the distribution of the tar on the road; such as unloading from trucks, dumping to the side of the road, opening the barrels, filling small tar kettles and heating the material by inefficient methods.

Concrete Patching

In cases where the concrete pavement becomes shattered or is broken down in an area of at least one square yard, it is desirable and imperative that it be repaired by some other method than the application of bituminous material and aggregate.

Such holes must be torn out and it is the best practice to dispose of the broken concrete, not using any of it in making the patch. It is desirable to enlarge the hole in area to a point where but few cracks radiate from or circle about the hole. The excavation should be made at least one inch below the old concrete, the ragged edge should be as nearly vertical as possible, if anything, undercut, so that the patch will give support to the surrounding concrete. No bituminous treatment should be given to the edges of the old concrete.

The best way of digging out the old pavement is by the use of a large portable air compressor, mounted on a five-ton trailer and driven by a 30 h.p. gasoline engine. The compressor should be of a capacity sufficient to furnish 125 cu. ft. of air per minute. This will necessitate a two-cylinder 8" x 8" compressor. This equipment is easily transported over any area accessible to motor truck haul. A compressor of this size will furnish air for two large concrete breakers, which have been found very effective in digging out and loosening the old concrete. In fact, three men so equipped will accomplish more per day in removing old concrete than will a gang of twelve men using the old method of sledge, pick, crowbar and jack.

The Mixing and Placing Plant

A small 7-S building mixer will mix as much concrete per day as the air compressor will prepare holes for. Trucks delivering the aggregate and cement to convenient piles along the road and wheelbarrows feeding the mixer and delivering mixed material to the holes is the most common and, I believe, the most efficient method of doing the ordinary concrete patching job. Where traffic is heavy, the establishment of a small central mixing plant is desirable. With this arrangement, a 14-S mixer should be used and should be fed with a batch hopper or bin which can proportion and feed the mix by gravity. The bin should be fed by a small revolving crane picking the material up from piles where it has been previously dumped from motor trucks. The mixed concrete from a central mixing plant can be distributed to the holes in the pavement either by small Ford trucks carrying one batch of concrete, or by motor buggies. The set-up for the central mixing plant should be made at frequent intervals, say one mile apart along the line of the road to be repaired. The great advantage of a central plant is that it does not clutter up the highway with material, cement and material, such as is necessary when the mixing is done with a portable mixer.

In order to facilitate traffic it is desirable to tear out and repair only one side of the road at a time, leaving the other side and shoulder free for passing vehicles. Where the hole in the pavement is at the edge, forms, consisting of 2 x 8's firmly staked or steel road forms, should be used, the patches should be struck off with a strike-board and should be belted; in fact, all the first-class methods used in the construction of a new road in the way of workmanship should apply to making patches. One of the most important things is to build the patch so there will be no unevenness in joining the old concrete with the new.

The use of hardeners such as calcium chloride, Cal and hydrated lime is recommended in all concrete used for patching. Experience indicates that about 5 per cent by weight is the right proportion. It is admitted that the resulting concrete may not ultimately be so strong with the use of hardener as without it, but it takes a permanent set so that it is safe to open the patch to travel within a week, instead of holding it closed the usual length of time. This is of so much greater importance than any other consideration that it makes the use of hardeners imperative.

A new joint filler is now coming into the market which may be of great benefit in the repair of joints and cracks. It is the color of portland cement and will thus eliminate one of the objections to the concrete pavement, namely, its irregular cracks repaired with black material. It has a high resistance to abrasion, is waterproof and does not disintegrate in hot weather. It is a composition of resin and gutta-percha and if it works out as satisfactorily in practice as it has in recent experiments by the U.S. Bureau of Public Roads, it may revolutionize our method of handling small repairs.

Firing a Steam Shovel or Dragline and Economizing in Fuel

Useful suggestions for the man on the job on the topic of fuel economy and firing with coal or wood in steam shovel or dragline operation are given in a recent issue of The Excavation Engineer, from which the matter following is taken.

The operator should be in charge of the machine, and his instructions should be followed by the crew. Both he and the fireman, as well as the other members of the crew, must work together to bring about the best results.

The fireman is a very important factor in the saving of fuel and water, and can bring about this saving by burning the minimum of fuel necessary, and by taking an intelligent interest in the condition and operation of the machine.

Explaining to a new fireman the reasons why certain methods should be pursued in handling his work to bring about the best results and directing his attention to improper methods of firing will result in a saving of fuel.

When filling the boiler before a fire is started, care should be taken that it is filled only so that the water glass shows half full or water runs from the second gauge cocks. This will leave space for expansion of water, and so that the injector can be worked to prevent the safety valve from popping.

Grates Should Be Clean

The grates should be kept clean and free from dead ashes and clinkers. The grates should be kept in a level position to prevent the fingers or edges of the bars being burned off. The ash pan must be cleaned as often as the work of the machine permits and at regular periods.

When coal or wood is applied to the fire, the volatile or gaseous matter is expelled and if properly mixed with air and heated to a sufficient temperature in the fire box, the mixture will ignite, be consumed and pass from the fire box through the tubes and stack as a colorless vapor, leaving the solid matter on the grates in the form of coke, which burns more slowly. If the gases are unconsumed, they will produce smoke. In order to keep sufficient temperature and air to ignite the gases, the fuel should be applied in thin layers thus allowing space for live fire. Green wood contains a large amount of water which must be evaporated. This vapor cools the temperature of the burning gases, therefore the wood must be burned in a deep fire.

As soon as a few pounds of steam are available, the blower may be used to create additional draft when building up a new fire. The fire door should be placed against the latch and not left open during the intervals when the fireman obtains his second, third, or more shovelfuls of coal or other fuel; thus giving an opening for the entrance of air to mix with the volatile gases and insure their consumption, eliminating black smoke. Experimentation alone will determine how long after the last shovelful the door should be left this way. Generally this is only a few seconds.

No hard and fast rule covering the depth of the fuel in the fuel box can be made. Good judgment must be used as conditions under which the machine is operated and the kind of fuel burned largely determine this. Large pieces of fuel do not make a satisfactory fire but fuel should be broken up before it is thrown into the fire box.

Keep Fire Even

Always fire as light and as level as possible consistent with steam requirements, scattering the fuel over parts where the bed is thinnest and the fire brightest, to prevent it from becoming dead in spots. Large quantities of fuel placed in the fire box at one time cools down the fire, causes smoke and wastes fuel. Small quantities at regular intervals keep the fire bright, reduces smoke and takes less fuel to keep up steam pressure, resulting in a reduction in the work of firing.

Heavy or uneven firing is apt to cause the boiler tube's flue sheets to leak, and may cause the fire box sheets to crack. As air connot pass readily through a heavy fire, cold air will be drawn through the thinnest places in the fire and possibly the fire door, resulting in chilling the flues and sheets, the formation of smoke, and a reduction in steam pressure.

The smoke box, its door and the stack should fit tight. Care should be taken to prevent holes rusting through the smoke box and stack. If the smoke box or stack have holes in them so that air leaks, it will allow the gases to cool and thereby decrease the draft. This condition often causes a poor steaming boiler, and is one which should and can easily be remedied.

The fire should be shaken or cleaned only when necessary to clear it of ash and clinker in order to admit sufficient air for proper combustion. Shaking or cleaning should be done carefully to avoid the loss of a good fire. The grates should be placed after each shaking or cleaning in a level position, to avoid burning the fingers, which will occur if the grates are allowed to remain at an angle with the fingers projecting into the fire.

The exhaust nozzle in the stack of forced draft boiler should be located in the centre of the stack so that the exhaust strikes evenly the sides of the round part of the stack, otherwise the boiler will not steam properly.

Waste of steam through safety valves should be avoided. Frequent blowing off of safety valves indicate poor firing, and economy is not being practiced.

Fuel can be saved by the proper use of the injector by feeding the boiler regularly at a rate governed by the demand, and by taking advantage of every opportunity to increase the height of water level when not working the machine to full capacity.

The water level should never be high enough to allow water or any moist steam to be carried through the steam pipes, the valve chambers and cylinders, because it will carry off the lubricant for these parts, and may result in serious damage, due to knocking out cylinder heads, breaking pistons or bending the connecting rods of the engine.

When banking or cleaning fires, the blower should be used as little as possible, to avoid rapid cooling of the fire box and flues, which may cause leaks.

Cleaning Fires

When cleaning fires, or with a banked fire, the excessive use of the injectors must be avoided, as the introduction of an excessive amount of water at such times will result in injury to the flues because of rapid reduction of temperatures of the water in the boiler producing contraction without sufficient heat in the fire box to counteract this effect.

After the fire has been cleaned of ash and clinker, the clean fire should be placed at the flue end of the fire box, and maintained in good condition by applying small quantities of fuel as may be required to prevent cold air from passing through the flue end of grates and injuring the flues.

Do not open the fire door too soon after banking a fire as the cold draft will damage the tubes. Twenty minutes at least should pass after banking the fire before opening the door. Always close the draft doors when you want a banked fire to last over night.

Almost any fire can be clinkered by stirring it up with a hook so that green coal gets down on the grates. A fire can also be clinkered by shaking the grates so hard that green coal works its way down through the fire. With certain classes of coal, heavy firing which causes banks to form in some portions of the fire will start clinkers. When a clinker has formed in a fire box it can sometimes be broken by shaking the grates with short, quick jerks, but as a general rule the fire must be cleaned to get rid of it. Trouble due to clinkered fires can be materially reduced by not shaking the grates so hard, not using the hook or slice bar so often, and by careful firing to prevent the formation of banks in the fire.

Some Things not to Do

Listed below are a few "don'ts" which have come to our attention:

Don't forget the rules attached to the steam gauge.

Don't forget to look at the water gauge or try the gauge cocks when first starting to work.

Don't fail to regulate the running speed of the boiler pump or injector to suit the requirement of an even water level. A constant feed is best if it can be so regulated.

Don't forget your regular times for firing and for cleaning fires. Don't allow holes to burn in the fire bed.

Don't forget to try the safety valve every day.

Don't let ashes accumulate under the grate—choking burns the bars; have stated times for cleaning.

Don't forget to regulate the dampers and doors to produce an even rate of combustion; if automatic dampers are in use they should be examined often.

Don't neglect to blow out the steam or water gauge connection and the pressure gauge connection as often as needed to keep them free from obstruction.

Don't forget to see that the blow-off valve is clear of obstruction after cleaning boiler by drawing water through it.

Don't neglect to pump up your boiler to the upper gauge line when stopping the machine at night. Start the pump before closing the throttle.

Don't forget to anticipate stopping the machine at night by partly closing the draught doors, opening the dampers, and spreading a little coal over the fire to prevent the sudden rising of the steam pressure after stopping the work. Then clean and bank the fires.

Mainly Constructional

East and West—From Coast to Coast

The program of local improvement works at Toronto this year will involve an expenditure of $5,616,382.

The Sarnia Cement Products, Ltd., at Point Edward, Ont., are busy on the rebuilding of their plant there, which was destroyed by fire recently. The new plant will be 100 x 60 ft. and the new equipment will consist of 3 drying kilns, cupola, 1 brick machine, 3 tile machines, 3 cement block presses, 1 30 h.p. motor and other miscellaneous machinery necessary to the manufacture of their line of products.

Upon the recommendation of the Dominion Fuel Board, the Federal Government has decided to proceed immediately with investigations into the possible development of central heating plants with particular reference to the extent to which their more extended use may contribute to the solution of the fuel problem.

A recent announcement states the Canadian Westinghouse Company, of Hamilton, are contemplating the erection of a new addition to their large factory there at an estimated cost of $1,250,000.

In a judgment handed down by the Court of Appeal at Quebec recently, the city of Levis was ordered to build a filter plant for their water works system. It is estimated that this plant will cost $110,000 and the reservoir an additional $50,000.

The new bridge over Stalter Gulley near St. Thomas, Ont., has been completed and it will only be a short time until the structure will be ready for traffic, the placing of a reinforced concrete pavement and the preparation of the road approaches being the only work remaining to be done. Messrs. James A. Bell and Son, civil engineers of St. Thomas, superintended the erection of this 300-ft. bridge structure.

The Quebec Exhibition Commission expect to spend approximately $300,000 on improvements and additions to buildings this year. At the present time the foundations of the new industrial building are being laid and this building is to be completed for the first of August. It will cost approximately $125,000 when completed. The stables at the grounds will be wrecked and replaced this year and a pretentious plan has been drawn up for the combining of the Agricultural Building with another large building for the placing of small livestock. In the centre of this building there will be a large amphitheatre which will seat 5,000 people. The three buildings will measure 740 feet frontage and the total cost will be in the vicinity of $150,000. This latter development will not be completed in time for this year's fair, however.

A recent announcement by one of the officials of the

Bell Telephone Company places the cost of the company's building and extension programme as planned for this year at $13,000,000. Naturally, a great bulk of this expenditure will be spent in the larger centres of Toronto and Montreal, but large sums will also be spent on development of the system in the smaller centres.

The Master Plumbers Association of Montreal recently rejected a proposed increase of 5 cents an hour in plumbers' wages.

A recent report states that the city council at Charlottetown, P. E. I., is applying to the provincial government for the following loans for building purposes: $50,000 for improvements to streets, $50,000 for housing, $20,000 for extension to water system, $10,000 for war memorial monument.

The successful tenderers on the new Auditorium entertainment palace at Ottawa, were as follows: Concrete and brick work, T. C. James; structural steel, Dominion Bridge Company; plumbing and ventilating, McKinley & Northwood; gypsum block roof, Keystone Gypsum Fireproofing Corporation, New York; roofing and cornice work, McFarlane & Douglas; painting and glazing, W. J. Carson; electric wiring, Fred Wilson; plastering, Murphy & Morrow. The carpentry work, which is a comparatively small item in this entirely fireproof structure, will be looked after by the Auditorium Company by day labor. The total cost of the finished structure, fully equipped, will be about $350,000, it is estimated. It will have a seating capacity of 9,500 and an ice surface of 80 x 200 feet.

A large delegation from Western Ontario interviewed Hon. Mr. Biggs recently in the interests of the proposed Blue Water Highway. The value of the Highway from a tourist standpoint was one of the arguments advanced by the representaives for this highway. It would connect the municipalities from Owen Sound to Windsor, following the shore lines of Georgian Bay, Lake Huron, River St. Clair and Lake St. Clair.

The work of driving piles for the Ford Motor Company's new $550,000 docks at Ford, Ont., was commenced recently. The contract is in the hands of Messrs. Considine & Reid and is to be completed by October 1 next. The docks will be the largest in Ontario, and will be built of the most permanent type. They will be 100 feet in width for the entire river-front length, having a width of 10 feet at the harbor line, constructed of solid concrete to a depth of eight feet, and resting on closely driven piling, reinforced with concrete and stone filling. The remaining width of 92 feet will be of reinforced construction for the 1,000 foot frontage. A force of 200 men will be employed on this work.

Messrs. Anglin-Norcross, Ltd., of Montreal, were awarded the contract for the erection of the new Drummond Court apartment building, in that city, which will be one of the largest buildings of its type in Canada. Work has already been commenced.

A start was made a few days ago on the additions to the Albert College at Belleville, Ont. The construction program here involves the expenditure of $224,000.

In speaking to a large delegation from Canadian Good Roads Association recently, asking for an extension of time for the taking up of the Federal grant for roads by the various provinces, Premier King expressed disapproval of the extension, saying in part "Little by little has been thrown over on the federal government obligations which it was never intended to meet. Our problem now is to find out how we can raise revenue for matters which, under the B. N. A. Act, come under federal jurisdiction. We must do this before considering further assistance to the provinces. There is no legal obligation, and I think there is no moral obligation to extend the period of the Canada highways act or to make a further grant."

At a luncheon of the Ottawa Branch of the Engineering Institute of Canada, in that city recently, it was announced that next year's annual meeting of the Institute will be held in Ottawa, sometime in January. Mr. Joseph Keele was the speaker, his subject being "The Valley of the Nile." Mr. Keele has just recently returned from that country and his remarks were very interesting.

Personal

Mr. F. C. Palmer, sanitary inspector of Oshawa, Ont., has resigned. His resignation takes effect at the end of the present month.

Mr. E. D. Todd, of New Westminster, B. C., has been appointed municipal engineer of South Vancouver. This position has been held by Mr. F. P. Wilson since the resignation of Mr. D. W. Johnston about a year ago. Mr. Todd was formerly employed by the provincial department of public works in an engineering capacity.

Dr. J. A. L. Waddell, bridge engineer, of Port Hope, Ont., was recently decorated by the Chinese Government, with the Second Class Order of the "Sacred Grain," in recognition of the engineering services rendered on Chinese railways during 1921. He was at that time appointed high technical adviser to the Chinese railway administration and went to China for the purpose of determining the proper bridge to be erected over the Yellow River. This project involved the expenditure of $6,000,000. Later Dr. Waddell made an inspection of all the railroads of China and made plans and recommendations for further construction. It was for this work that the decoration was given.

Mr. Robert Parker, building inspector and fuel commissioner of Windsor for the past six years, resigned recently. Mr. Parker was formerly in the building and contracting business at Essex and for eight years was treasurer of the Essex County Builders & Contractors' Association.

Mr. Power, of the well-known engineering firm of Chipman & Power, Toronto, has been appointed by the town of Milton, Ont., to report on the cost of a sewerage system for the town.

Mr. Ronald Harrison, of Toronto, has been appointed water works superintendent of Scarboro Township, Ont. Mr. Harrison is a graduate of the University of Toronto, in engineering, and served for three years overseas with the Canadian Engineers. For some time past, he has been connected with the Hydro-electric Power Commission of Ontario, latterly as superintendent for the commission at Thessalon, Ont.

Mr. C. S. Cobb, one of Toronto's most prominent architects, left that city recently to take up residence and carry on his profession at some point in the United Sates. Mr. Cobb had not determined before he left just where he would locate permanently, but it is believed he intended investigating the possibilities of Los Angeles as a new field for his work. Mr. Cobb was well known among architectural circles in Ontario and designed several of the province's fine buildings, including the new Muskoka Sanitarium at Gravenhurst, the new Registry Office at Toronto and Fairweather's fine store at Toronto.

Obituary

Prof. Adrian Berrington, associate professor of architecture, University of Toronto, died in England about two weeks ago. Prof. Berrington underwent a serious operation while on vacation in England last summer and never fully recovered. Prof. Berrington served with the Royal Engineers throughout the period of the War.

Mr. Robert Charles Lowry, civil engineer, of New Westminster, B. C., died recently in St. Mary's Hospital at that city, following a long illness. Mr. Lowry was 65 years of age and was born in Ireland, coming to this country in 1893 and locating in New Westminster.

CONSTRUCTIONAL ACTIVITY

Period of April 11 to April 17, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Aldborough Twp., Ont.
Road improvements, costing $15,000, planned by the Township Council. J. A. McRae, clerk.

Arthur, Ont.
Town Council will shortly consider the question of laying a pavement on Main St. Mr. Irvine, reeve.

Burlington, Ont.
Tenders will be called soon for a pavement for the town. L. Sykes, clerk.

Cochrane, Ont.
Town Council contemplates sewer extensions and waterworks system costing $50,000. W. L. Warrell, clerk.

Durham, Ont.
Contemplated waterworks system for the town will cost $75,000. Plans and estimates are being secured.

Ekfrid Twp., Ont.
Improvements to the drainage system contemplated by the Township Council. A. P. McDougald, Melbourne, clerk.

Exeter, Ont.
An extension to a watermain contemplated by the Town Council. Councillor Francis, interested.

Francis, Sask.
The rural municipality of Francis, No. 127, will receive tenders on grade work until May 11. J. N. DeStein, Parson's Engineering Co., Regina, has specifications.

Hibbert Twp., Ont.
Drainage work contemplated by the Township Council. James Gordon, Dublin, Ont., clerk.

Howick Twp., Ont.
Plans are to be prepared for extending, deepening and widening a drain. Other work also proposed. C. E. Walker, Gorrie, Ont., clerk.

Metcalfe Twp., Ont.
Township Council wants tenders on a drain costing $2,500. Tenders will be received until May 7. Jas. McGregor, Glencoe, engineer.

Moncton, N. B.
Sewers contemplated by the City will cost about $20,000. J. Edington, engineer.

Oshawa, Ont.
About 150 yards of sidewalk contemplated by the East Whitby Council. P. G. Purvis, Columbus, Ont., clerk.

Ottawa, Ont.
Plans are drawn for an asphalt and woodblock pavement costing $112,000. Underground work will start shortly and tenders on the balance of the work will be called before June 1.

Tarvia pavement costing $5,000 will be laid by the City between Clarence and St. Patrick Sts. on Rockwood Ave.

City of Ottawa contemplates an asphalt pavement. A. F. Macallum, Commissioner of Works.

Pictou, N. S.

Concrete sidewalks costing $6,000 proposed by the Town Council. J. F. McDonald, clerk.

Port Colborne, Ont.
Road improvements are contemplated by the Town Council and include repairs to the Port Colborne-Marshville macadam road. J. H. White, clerk.

Province of Nova Scotia.
Tenders for gravel roads will be received by W. A. Hendry, engineer, Halifax, as follows: Halifax-Yarmouth Road via South Shore Route; Goatlake bridge-Middle River bridge, 6.4 miles, until April 23. Middle River bridge-Barkhouse Brook, 9.5 miles, until April 26. Barkhouse Brook,-Mahone Town Line, 6.0 miles, until April 26. Royal Bank Building, Barrington Passage-Shag Harbor, 5.75 miles, until April 23. Truro Glace Bay Road; Truro Town Line-Valley Station Road, 3.87 miles, until April 28. Valley Station Road Kemptown Bridge, 9.42 miles, until April 28. Kemptown Bridge-Lower Mt. Thom, 7.67 miles, until April 23. Telford Kenzieville, 8.8 miles until April 28. Truro-Parrsboro Road; Carr's Brook-Five Islinds, 5.40 miles, until April 26.

Province of Ontario.
Tenders for road work for the Province of Ontario, as advertised on page 51, Contract Record, April 11, will be received by W. A. McLean, Deputy Minister of Highways until April 30.

Ste. Cecile Parish, Que.
H. Lapierre, Valleyfield, will shortly lay four miles of macadam roadway for the Town Council.

St. Laurent, Que.
Ernest Gohier, 30 St. James St., Montreal, has been appointed engineer for the proposed $20,000 roadway. G. Lapointe, secretary.

Town Council contemplates sidewalks costing $10,000. Ernest Gohier, 30 St. James St., Montreal, engineer.

Sewers costing $15,000 contemplated by the Town Council. Ernest Gohier, 30 St. James St., Montreal, engineer.

Salaberry, Que.
Three miles of macadam road will be laid for the Town Council by Louis Cossette, Valleyfield.

Sherwood, Sask.
Tenders are being received by the rural municipality of Sherwood, No. 159, until May 4 for grading. Specifications with J. N. De Stein, Parson's Engineering Co., Regina, Sask.

Tavistock, Ont.
Oxford County Council contemplates a concrete pavement to link up Provincial Highway. This work expected to proceed in June. Mr. Baecheller, Tavistock, reeve.

Thorold, Ont.
A pavement is contemplated by the Town Council. D. J. C. Munro, clerk.

Toronto, Ont.
City of Toronto will receive tenders on sewers until Apr. 24. Specifications mey be seen at the City Hall.

Tenders for laying water pipes will be received by the City of Toronto until Apr. 24.

Valleyfield, Que.
Town Council wants prices on cast iron pipes, 4, 6, and 10" and hydrants. L. J. Boyer, clerk.

Welland Co., Ont.
Highways costing $100,000 contemplated by the County Council. R. A. Cooper, Welland, County Clerk.

York Twp., Ont.
The Township is receiving tenders on watermains until April 21. F. B. Godike, 40 Jarvis St., engineer.

CONTRACTS AWARDED

Estevan, Sask.
Canadian Pacific Railway will replace wooden water pipe with cast iron. T. W. Brown, 193 River Ave., has the general contract.

Hull, Que.
Standard Paving Co., Central Chambers, Ottawa, have paving contracts for the City as follows: Main St., asphalt, $39,879; Bridge St., asphalt, $10,000; Youville St., sandstone blocks, $7,800.

Regina, Sask.
General contract for concrete culverts from Regina to Colonsay costing $24,000 awarded to C. W. Johnston, 911 McCallum Hill Bldg., Regina. These culverts are being built for the Canadian Pacific Rly.

Toronto, Ont.
The general contract for sewers costing $15,902 has been awarded to W. E. Taylor, 22 Falcon St.

Contracts for laying water pipes for the city awarded as follows: F. D. Turis, 318 Euclid Ave., for $2,580; Ruscica Bros., 256 Ontario St., $901.

Railroads, Bridges and Wharves

Blanstead Twp., Ont.
Perth County Conucil proposes to build a bridge. J. Rogers, Stratford, County Engineer.

Bronte, Ont.
Repairs to piers costing $5,700 plan-

ned by the Dominion Government, which has included this appropriation in 1923 estimates.

Chateauguay, Que.
Tenders for a bridge for the town are being received by the Town Clerk until May 8.

Chatham, Ont.
The Dominion Government contemplates repairs to the revetment wall costing $16,000. R. C. Desrochers, Dept. of Public Works, Ottawa, secreatry.

Cobourg, Ont.
Dominion Government may reconstruct the breakwater at a cost of $25,000. This item was included in the estimates for this year.

Collingwood Twp., Ont.
Concrete and steel bridges contemplated by the Township Council. B. Hamilton, Clarksburg, clerk.

Hamilton, Ont.
Harbor Commissioners, 47½ Main St. East, contemplate docks. Chairman, Wm. Ainslie.

Lakefield, Ont.
Peterboro County Council is having plans prepared for a bridge costing $16,000. A. W. Connor, 34 Victoria St., Toronto, engineer.

London, Ont.
City Council contemplates rebuilding Ridout St. bridge or may build a new bridge. W. P. Near, engineer.

Meaford, Ont.
Proposed repairs to be made to piers by the Dominion Government will cost $5,400. R. C. Desrochers, Ottawa, secretary.

Midland, Ont.
$9,400 has been included in the estimates for 1923 by the Dominion Government for repairs to wharves.

Oakville, Ont.
The reconstruction of the superstructure of the east pier contemplated by the Dominion Government. R. C. Desrochers, Parliament Buildings, Ottawa, secretary.

Point Edward, Ont.
Steel Co. of Canada are rebuilding a dock. W. Ticheborne, London, is in charge of work and buys material.

Pondeau, Ont.
Repairs to piers planned by the Dominion Government and included in the estimates for 1923 will cost $10,000. Secretary, R. C. Desrochers, Ottawa.

Port Stanley, Ont.
London & Port Stanley Rly., London, contemplate rebuilding a slip dock at a cost of $10,000. J. E. Richards, manager.

London & Port Stanley Rly., London, contemplate an incline railway elevator costing $7,500. J. E. Richards, manager.

Riviere du Lievre, Que.
Proposed re-construction of protection walls by the Dominion Government will cost about $10,000. This amount is included in the estimates for this year.

Riviere Oulle, Que.
For repairs to a wharf the Dominion Government has allowed $5,600 in this year's estimates.

Roberval, Que.
At a cost of $4,000, the Dominion Government proposes to repair the wharf.

St. Alexis, Que.
The Dominion Government has included in the 1923 estimates $8,000 for repairs to the wharf. R. C. Desrochers, Ottawa, secretary.

St. Anne de Chicoutimi, Que.
$8,500 allowed in the 1923 estimates by the Dominion Government for repairs to the wharf.

Ste. Anne de Monts, Que.
For the re-construction of a training pier the Dominion Government has allowed $11,000 in the 1923 estimates. R. C. Desrochers, Parliament Buildings, Ottawa, secretary.

St. Magloire, Que.
J. A. Piglon, secretary, receiving tenders until May 15 for a bridge. Plans, etc. with secretary.

Ste. Marie de Monnoir, Que.
Tenders are being received until May 7 for a steel bridge. H. Ste. Marie, Marieville, secretary, has plans, etc.

Southampton, Ont.
Repairs to the breakwater contemplated by the Dominion Government will cost $6,000. R. C. Desrochers, Ottawa, secretary.

Wellington County, Ont.
County Council contemplates new bridges and retaining walls costing $50,000. Jas. Beattie, St. Andrew's St., Fergus, clerk.

Whitby, Ont.
Reconstruction of piers contemplated by the Dominion Government at a cost of $19,500. R. C. Desrochers, Ottawa, secretary.

CONTRACTS AWARDED

Mattawa, Ont.
Angus & Taylor Co., North Bay, Ont., have the contract for a railway line from Mattawa to Ville Marie, Que., for the Canadian Pacific Rly.

Public Buildings, Churches and Schools

Attercliffe Station, Ont.
Tenders for a $7,000 school are being received by H. McLaughlin, R.R. 2, Dunnville, from April 20 to May 15 inclusive. Prices are wanted on No. 1 face brick and concrete blocks.

Beauceville, Que.
School is contemplated by the Sisters Jesus-Marie, Beauceville. Architect not yet appointed.

Beauport, Que.
H. Laberge, 103 St. John St., Quebec, is preparing plans for the proposed school.

Blenheim, Ont.
Bulk tenders for a continuation school are being received by the secretary of the school board, W. J. Baird, until April 23. Building will cost about $25,000.

Brampton, Ont.
Burden & Gouinlock, 110 King St. West, Toronto, have been appointed architects to prepare plans for the proposed school.

Brantford, Ont.
Tenders have been called by A. K. Bunnell, City Hall, secretary of the Board of Education, for an addition to the Collegiate costing $81,000.

Campbellford, Ont.
General tenders are being received by S. B. Coon & Son, 4 St. Thomas St., Toronto, for a $95,000 High School until April 23.

Etobicoke Twp., Ont.
Bulk and separate tenders for alterations and addition to the school are being received by Walker & Gibson, 70 Victoria St., Toronto, until April 26. J. Gair, 32 Temperance St., Toronto, secretary.

Ford, Ont.
Bulk and separate tenders for the addition to the Separate school are being received by Pennington & Boyd, Windsor. Ford City Separate School Board, owners.

Newmarket, Ont.
Plans are being prepared for an addition to the High School. O. Tench, architect, K. N. Robertson, secretary.

Petrolia, Ont.
Congregation of the Methodist Church proposes to build a gymnasium. Rev. J. D. Richardson, pastor.

Sydney Mines, N. S.
McNeil Bros., Sydney Mines, will shortly commence work on a $80,000 school for the Roman Catholic corporation. A. J. McCormack, Ross Block Sydney, architect.

Toronto, Ont.
Tenders will be called shortly by the Board of Control for a reception Hospital costing $360,000. J. N. Wilson, 90 University Ave., engineer.

Windsor, Ont.
Methodist Congregation contemplate a church. Rev. T. A. Allen, 446 Erie St., minister.

CONTRACTS AWARDED

Brantford, Ont.
Thos. Harper, 14 Jarvis St., has been awarded the general contract for a school costing $45,000 by the Board of Education. A. K. Bunnell, City Hall, secretary.

Bronte, Ont.
Thos. Shields, Colborne St., Oakville, has the general contract for a $40,000 school for S.S. No. 13.

London, Ont.
John V. Gray Construction Co. Ltd., 34 Bank of Toronto Chambers has been awarded the general contract for a $60,000 monastery.

North Easthope, Ont.
Conrad L. Forler, New Hamburg, Ont., has the general contract for a school costing $9,000. J. D. Fisher, Stratford, clerk.

Toronto, Ont.
Peerless Artificial Stone Co., Coxwell Ave., have the contract for art stone for the $110,000 addition to the Pure Food Building at the Exhibition Grounds. A. W. Carmichael Ltd., has the contract for roofing and sheet metal.

Herbert Baxter, Stop 21, Lake Shore Rd., has the general contract for a school

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

Tender for School

Tenders will be received until noon on Monday, 30th April, 1923, for addition and alterations **Public School in Bolton.** Plans and specifications may be seen at the office of F. E. Snider, Secretary, Bolton, Ont., or Wm. R. Gregg, Architect, 23 Jordan St., Toronto. 16

City of Stratford

SEALED TENDERS, marked Tenders for Paving will be received by the undersigned up to 12 o'clock noon, Saturday, April 28th, for approximately 35,000 square yards of Concrete Base, 30,000 square yards of Asphalt Surface and 32,000 lineal feet of combined concrete Curbs and Gutters.

Further information may be obtained at the office of the City Engineer.

The lowest or any tender not necessarily accepted.

A. B. Manson,
16 City Engineer.

Fire Truck

Tenders will be received by the undersigned until 5 P.M. Monday, April 23rd, for the supplying to the City of St. Thomas a motor driven city service ladder truck.

Specifications and form of tender can be obtained on application.

W. C. MILLER,
16 City Engineer.

Notice to Contractors

Tenders for Sewers

Tenders will be received addressed to the Village Clerk, Village Hall, Port Dalhousie, Ont., up to five o'clock P.M. of

Tuesday, May 1st, 1923,

for the construction of the following sewers:

1540 lin. feat of 10 inch tile
600 " " " 12 " "
540 " " " 15 " "
1900 " " " 18 " "

Plans profiles and specifications may be seen at and form of tender obtained from the office of the Village Clerk.

Envelopes containing tenders must be plainly marked as to contents.

All tenders must be accompanied by a marked cheque for five per cent of the amount of the tender, together with the name of an approved Guarantee Company.

The lowest or any tender not necessarily accepted.

J. A. WELLINGTON,
16 Reeve.

RATES

20 cents per agate line (14 lines to the inch) Positions Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

TENDERS

Tenders will be received by the Separate School Board of Toronto for the erection of an eight room school in Dewson Street, Toronto.

Plans and specifications may be seen at the office of the architect, J. P. Hynes, 73 King Street West, Toronto.

Tenders close at five o'clock p.m. April 30th, 1923, at the office of the board, 477 Jarvis Street, Toronto.

Lowest or any tender not necessarily accepted.

E. F. Henderson,
16-17 Business Agent for the Board.

Tenders Wanted for Drainage Work

Sealed tenders, marked "Tenders for Drain", will be received by the undersigned until, and including

May 1st, 1923,

for furnishing requisite materials for excavating, enlarging and completing, Phelpston Marsh Drain in accordance with the specifications and profiles relating thereto.

Plans and specifications may be seen at the office of the Township Clerk of Flos, Elmvale, Ontario, and at the Office of J. J. Newman, Engineer, Windsor, Ontario.

Marked cheque for 10 per cent of the amount of the tender must accompany tenders.

Lowest or any other tender not necessarily accepted.

C. S. BURTON, Clerk Flos,
16-17 Elmvale P.O., Ontario.

Town of Campbellton, N. B.

Tenders for Pavement

Sealed tenders plainly marked as to contents will be received by the undersigned until

7th of May, 1923.

for the construction of, Hot Mixed Paving 36,000 [illegible]

Plans, specifications and form of tender may be seen at the office of the Engineer.

The lowest or any tender not necessarily accepted.

R. J. SANDOVER SLY,
Town Engineer.

Town Engineer's Office,
Campbellton, N.B. April 11th, 1923. 16-18

TOWNSHIP OF ETOBICOKE

Tenders for Reinforced Concrete Bridges and Grading

Sealed tenders properly marked and addressed to Mr. S. Barratt, Islington, Ontario, will be received up to **12 o'clock, noon, Monday, May 7th, 1923,** for the construction of two reinforced concrete bridges and also for about 12,000 cu. yards of filling for the approaches. Plans and specifications may be seen at the office of the Township Engineer, Islington, or the office of the Consulting Engineers, 36 Toronto Street, Toronto.

N. MacNicol, Township
Engineer, Islington,

Stephen Barratt,
Township Clerk,
Islington
W., Guardhouse
Reeve.

James, Proctor & Redfern, Limited,
Consulting Engineers,
36 Toronto Street,
TORONTO. 16

Tenders for Improvement of Road

Pursuant to the requirements of The Canada Highways Act, sealed tenders marked "Tenders for Project 26, Section A—subsection (a)" will be received by the undersigned until twelve o'clock noon on

Wednesday, May 9th, 1923,

for the excavation of approximately 38,000 cubic yards of earth and other work required in the construction of Provincial highway Meota South-east, 10 miles.

Copies of plans, profiles and specifications may be seen at the office of the undersigned, and at the office of each of the following parties:

W. M. Grant, 105 Ross Block, Saskatoon, Sask.; J. R. Reid, Court House, Swift Current, Sask.; F. G. Kissack, Dominion Grain Co., North Battleford, Sask.; A. E. Thompson, Sec-Treasurer R.M. No. 468, Meota, Sask.

An accepted cheque for the sum of $700.00 payable to the Deputy Minister of Highways, or a Guarantee Company's bid bond, must accompany each tender.

The right to reject any or all tenders or to waive any defects or irregularities therein is to be at the discretion of the Minister of Highways. Tenders will be opened in public in the office of the Deputy Minister at the hour of 4 p.m., Wednesday, May 9th, 1923.

The unauthorized insertion of this advertisement will not be paid for.

H. S. CARPENTER,
Deputy Minister of Highways.
Department of Highways,
Regina, Sask.
April 18th, 1923. 16

SEALED TENDERS

Marked "Tenders for O'Brian Drain" will be received by us at our office in the Town of Vankleek Hill until two o'clock in the afternoon of

Saturday the 12th day of May, 1923

for the completion of the work of constructing the Main Outlet of the O'Brian Drain in the Township of Caledonia near Caledonia Springs Station. A considerable portion of the excavation consists of peat, which has caved in and there are also large masses of peat, which have become detached from the main body of peat along the sides of the drain which will be required to be removed. The whole work is to be completed on or before the 15th day of October, A.D. 1923.

A cash deposit or accepted cheque on a chartered bank equal to 5% of the tendered price must accompany each tender.

The lowest or any tender not necessarily accepted.

The estimated quantities of excavation for a completed drain having a bottom width of 5 ft. and with side slopes of ½ horizontal to 1 vertical is 15,540 cu. yds. This does not include a large portion of the masses of peat, which have become detached.

Contractors are requested to tender a lump sum price for the construction of a finished drain of the form above described.

Forms of tender may be procured and specifications examined at our office, at the office of The Township Clerk, St. Amour, Ont., or at the office of W. H. Magwood, Civil Engineer, Cornwall, Ont.

Dated at Vankleek Hill, Ont.,
This 14th day of April A.D. 1923

HALL & HALL,
Solicitors for Tp. of Caledonia. 16-17

Tenders for Improvement of Road

Pursuant to the requirements of The Canada Highways Act, sealed tenders marked "Tenders for Project 5, Section F—subsection (b)" will be received by the undersigned until twelve o'clock noon on

Wednesday, May 9th, 1923,

for the excavation of approximately 35,000 cubic yards of earth and other work required in the construction of Provincial highway St. Gregor to Muenster.

Copies of plans, profiles and specifications may be seen at the office of the undersigned, and at the office of each of the following parties:

W. M. Grant, 105 Ross Block, Saskatoon, Sask.; J. R. Reid, Court House, Swift Current, Sask.; F. G. Kissack, Dominion Grain Co., North Battleford, Sask.; P. Weber, Sec-Treasurer, Village of Muenster, Sask.

An accepted cheque for the sum of $700.00 payable to the Deputy Minister of Highways, or a Guarantee Company's bid bond, must accompany each tender.

The right to reject any or all tenders or to waive any defects or irregularities therein is to be at the discretion of the Minister of Highways. Tenders will be opened in public in the office of the Deputy Minister at the hour of 4 p.m., Wednesday, May 9th, 1923.

The unauthorized insertion of this advertisement will not be paid for.

H. S. CARPENTER,
Deputy Minister of Highways.
Department of Highways,
Regina, Sask.
April 18th, 1923. 16

Tenders for Bridges and Culverts

County of Kent

Sealed tenders will be received by the undersigned up till noon on

Friday, May 4th, 1923,

for the construction of nine concrete and steel bridges and culverts in the County of Kent. One bridge is of seventy feet span and the other bridges and culverts vary from eight feet span to sixteen feet span.

Plans and specifications and forms of tender and contract may be seen at the office of W. G. McGeorge, C.E. Chatham, Ontario.

The lowest or any tender not necessarily accepted.

L. A. PARDO,
County Road Superintendent,
16-17 Chatham, Ontario.

DEPARTMENT OF ROADS

TENDERS

Resurfacing on Regional Highways

Tenders made on forms supplied by the Department of Roads and placed under envelopes bearing the words: "Tender—resurfacing regional highways," shall be received at the office of the Minister of Roads, in the city of Quebec, Government Building, up to one o'clock of the afternoon, on **Thursday the third (3) of May, 1923**, for the Resufacing of the following highways:

Municipality	Kind of Resurfacing	Length
Levis-Jackman Highway		
Beauceville town, ...	Bit. Mac.	1.74 miles
St-Bruno-Roberval-St-Bruno Highway		
Roberval, town	Bit. Mac.	3.29 miles
Roberval, p	Gravelling	8.62 miles
Levis-Rimouski Highway		
Bonsecours, v.	Bit. Mac.	1.30 miles
Levis-Sherbrooke Highway		
Warwick, v.	Macadam	1.61 miles
Arthabaska, town, ...	Macadam	2.05 miles
Richmond-Yamaska Highway		
Grantham, t.	Gravelling	3.06 miles
St-Germain-de-Grantham.	Gravelling	5.25 miles
St-Edmond-de-Grantham,	Gravelling	0.34 miles
St-Hyacinthe-Drummondville Highway		
St-Germain-de-Grantham,	Gravelling	0.94 miles
Drummondville-Annaville Highway		
St-Cyrille-de-Wendover	Gravelling	1.17 miles
Wendover & Simpson	Gravelling	4.00 miles
Iberville-St-Albans Highway		
St--Sebastien, p	Macadam	3.78 miles
St-Athanase, p.	Macadam	1.89 miles
St-Georges-d'Henryville,	Macadam	2.10 miles
Lacolle Knowlton Highway		
Dunham, t.	Gravelling	4.76 miles
Dunham, v.	Gravelling	0.49 miles
Cowansville, v	Gravelling	0.89 miles
Sweetsburg, v.	Gravelling	1.47 miles
Montreal-Hull Highway		
Ste-Scholastique, p.	Oiled Mac.	0.81 miles
Caughnawaga-Malone Highway		
Elgin, t.	Macadam	0.71 miles
Laprairie-Lacolle Highway		
St. Jean, county	Macadam	0.77 miles
Montreal-Toronto Highway		
Vaudreuil; p.	Macadam	3.68 miles

J. L. BOULANGER,
Deputy Minister.
Quebec, April 11th, 1923. 16

WANTED

Manager to take charge of painting and decorating department. Apply Henry Morgan & Co. Ltd., Factories, 139 Beaver Hall Hill, Montreal. 15-16

Equipment for Sale

Complete equipment for rock quarrying and macadam road construction. Apply Box No. 217, Contract Record, Toronto. 15-T.f.

To Rent

Steam Road Roller, First Class Shape. The T. Sidney Kirby Co. Limited, 213 Sussex St., Ottawa. 16-T.f.

FOR SALE

No. 6 Gates Gyratory Crusher Type K with extra parts and in good running condition. Also 12 H.P. heavy duty gasoline engine. Both for immediate sale. Apply R. H. Miner Company, Ltd., 207 St. James Street, Montreal. 15-18

WANTED

General Manager for Company engaged in building, contracting and manufacturing wood products. Apply Box 206, Contract Record, Toronto. 15-16

Road Wagon Tanks for Sale

horse drawn, suitable for watering or oiling roads, or transporting liquids—capacity 600 gallons—solidly built. Apply British American Oil Co. Ltd., 1090 Duroche Ave., Outremont, Que. 16

STEEL PILING

Bought and Sold

Universal Equipment Company
Niagara Falls. 11-T-f.

Some One Wants to Buy

The equipment or machinery that you are not using.

It may be occupying valuable space in your yard or shop, collecting dust, rust and hard knocks.

Sell it before "Depreciation" scraps it.

Use the Tender & For Sale Department. It helps others, let it help you.

FOR SALE

Keystone Excavating Machine, complete with two sticks, skimmer scoop, and three ditching scoops; this machine has been used only one season and is guaranteed to be in first class condition. Price $4,500 f.o.b. St. John, N. B.

Austin Backfiller with caterpillar traction, 4-cylinder Buffalo engine, in equally good condition. Price $2,500 f.o.b. St. John, N. B. Canada Lock Joint Pipe Limited, 65 Pleasant Boulevard, Toronto, Ont.; or St. John, N. B. 6-T.f.

CONSTRUCTION SUPERINTENDENT with 15 year's experience handling all classes of building and water work, wants position. A1 testimonial and guarantee results. Will go anywhere, Box 205, Contract Record, Toronto. 15-17

COUNTY OF ONTARIO

TENDERS

Sealed tenders, plainly marked "Tender", will be received by the undersigned until 12 o'clock [illegible]

Friday, April 27th, 1923,

for the construction of several concrete culverts, also Grading and Hill cutting on County Roads in Uxbridge and E. Whitby Tps.

Plans and specifications may be seen at the County Road Engineer's office, County Buildings.

All tenders must be accompanied by a marked cheque for 5% of the amount of tender.

The lowest or any tender not necessarily accepted.

D. J. KEAN,
County Road Supt. & Engineer,
County Buildings, Whitby, Ont.
16

Tender for Addition to Brantford Collegiate

Sealed tenders for the building and completion of an addition to the Brantford Collegiate Institute, addressed to the Rev. Charles E. Jeakins, Chairman of the Buildings and Grounds Committee of the Brantford Board of Education, c/o Arthur K. Bunnell, Secretary, City Hall, Brantford, will be received up till noon, on

Tuesday, May 1st,

A marked cheque for not less than 5% of the amount of the tender must accompany same.

Copy of plans and specifications, and any further information, will be furnished on application to Frederick C. Bodley, Architect, Temple Building, Brantford.

The lowest or any tender not necessarily accepted.

ARTHUR K. BUNNELL,
Secretary.
16

TO CONTRACTORS

Sealed tenders, for all work excepting heating, plumbing, and electric wiring, marked "Tender for Memorial Hall," addressed to the undersigned will be received at this Department until

Saturday, the 5th day of May,

for the erection of a War Memorial Hall on the grounds of the Ontario Agricultural College, Guelph.

Plans and specifications may be seen at the office of the Bursar at the College at Guelph and at this Department.

Each tender must be accompanied by an accepted bank cheque, payable to the Hon. F. C. Biggs, Minister of Public Works and Highways, Ontario, for five per cent. of the tender, and the bona fide signatures and addresses of two sureties, or the name of a Guarantee Company approved by the Department, willing to provide a bond for the due fulfilment of the contract.

The Department is not bound to accept the lowest or any tender.

By Order,
H. F. McNAUGHTEN,
Secretary, Public Works Department, Ontario.
Toronto, April 11th, 1923.

Newspapers publishing this without authority will not be paid for it. 16

ARCHITECTURAL DRAUGHTSMAN WANTED capable of designing and overseeing steam and hot water installations for schools, churches and business buildings, also familiar with structural steel, reinforced concrete and general architectural work. Good position for right man. Only strictly temperate man need apply. Give references. Samples of work and wages required, also places held last three years. F. Neil Brodie, Architect, 42 Princess Street, St. John, N.B. 16-18

Stone Crushing

Man wanted with complete equipment to undertake crushing and screening of approximately 1800 yards stone. Apply Box 229, Contract Record, Toronto. 16

Wanted to Hire

A fleet of Ford Ton Dump Trucks. Steady work for most of season. Box 216, Contract Record, Toronto. 16

For Sale

1 Keystone Excavator with extra Skimmer Scoop, ditcher bucket and sticks, in first class condition. Price complete $4200.00. Apply Box 215, Contract Record, Toronto. 16

Brick Plant for Sale or Lease

The undersigned have instructions to sell or lease a complete Silica Pressed Brick-Making Plant with full equipment, together with extensive deposits of sand used in the manufacture. It has been operated for years profitably. The daily capacity is 20,000 bricks. It is situated close to the main line of the Grand Trunk Railway with a switch in the yards.

For further particulars and terms apply to

READ & WATEROUS, Barristers, etc.,
127½ Colborne St.,
Brantford, Ont.
16

FOR SALE

25 Ton Industrial Locomotive Crane 8-Wheel, 50 ft. Boom.

1250 Yard Barber Portable Asphalt Plant.

3 Ton Plymouth Gasoline Locomotive, 36" gauge.

WILSON EQUIPMENT CO.,
117 Wellington West, - Toronto
Phone: Adel. 8069 Nights: Park. 3296W
16-17

FOR SALE

All Steel Revolving Guy Derrick

Capacity—10 Tons.

Mast 90 ft. High. Boom 80 ft. Long. Both in Sections about 30 ft. ....

Complete with Bull Wheel, Sheaves, Pins, etc. No Cable or Guy Ropes.

PRICE: $850.00 f.o.b. cars, New Glasgow, N.S.

This Derrick was built for our own Erection Department and is First Class in Every Particular.

THE MARITIME BRIDGE CO LTD.,
New Glasgow, N.S.
16

WANTED—General Foreman to take charge of concrete bridge work. Must be thoroughly competent, reliable and able to show results. State experience in full, also references and salary required. Apply Box 225, Contract Record, Toronto. 16

FOR SALE

Street Cars and Parts

The Commission offers for sale the following complete street cars, car bodies, trucks, motors etc. Sealed Tenders addressed to the Chairman, endorsed "Tender for Street Cars and Parts" will be received until noon of

May 12th, 1923,

at the offices of the Commission, Public Utilities Building, 35 Yonge St., Toronto, Ontario. A cheque for 5% of the amount of the offer, payable to "The Toronto Transportation Commission," drawn on and accepted by a Canadian chartered bank, must accompany each Tender. Tenders for the whole or part of the lot offered will be received. The cars and materials offered are now on the Commission's property in Toronto, and Tenders must be based on acceptance as and where the cars and materials are located.

59	**Single-truck cars complete with G.E.-67 motors;**
6	**Single-truck cars complete with G.E.-1000 motors.**
1	**Brill M.T. truck car complete with G.E.-67 motors.**
2	**Single truck trailer cars complete.**
	Also 11 single-truck motor car bodies and trucks (no motors).
7	**Double-truck closed motor car bodies (no motors or trucks).**
10	**Single-trucks (no bodies) with G.E.-1000 motors; 6 G.E.-1000 motors and 6 pairs of wheels (no trucks nor bodies).**

A condition of the acceptance of any Tender is that the cars or materials must be removed by the tenderer from the property of the Commission within one calendar month from date of notification of acceptance from the Commission to the Tenderer by registered mail.

Copies of a detailed inventory may be secured and appointments to inspect may be arranged through the Executive Department, Public Utilities Building, 35 Yonge St., or the Rolling Stock Department, 4 Sherbourne Street.

The highest or any tender not necessarily accepted.

H. H. COUZENS,
General Manager,
TORONTO TRANSPORTATION COMMISSION.
16

POSITION WANTED by competent man as foreman in planing mill and factory. Good draughtsman. Box 226, Contract Record, Toronto. 16

CONTRACTOR'S SUPERINTENDENT, just disengaged, requies position, life-long experience, well up in all classes construction, quantities and estimating, excellent references. Box 224, Contract Record, Toronto. 16

Architects!

Send a copy of your plans to the offices of the "Contract Record"

The easier you make it for the bidders to tender, the more tenders you will get.

You can make it easier by placing a copy of your plans on file at any of the offices of the "Contract Record".

This practice, when used in conjunction with an advertisement in the tender department, is undoubtedly the most effective and economical method of obtaining bids.

Give it a trial.

Contract Record
and Engineering Review

Toronto	345 Adelaide St. W.
Montreal	119 Board of Trade Bldg.
Winnipeg	302 Travellers' Bldg.
Vancouver	106 Winch Bldg.

at Lorne Park, costing $29,488. R. B. Colloton, Lorne Park, secretary.

Weston, Ont.
Contract for sheet metal and roofing for the industrial school awarded to W. A. Moffatt, 14 Fallingbrook Rd., Toronto. Plumbing and heating contracts awarded to Wm. Howard, Howland Ave., Toronto

York Township, Ont.
C. Wood & Sons, 613 Manning Ave., Toronto, was awarded the excavating contract for the Public School.

Business Buildings and Industrial Plants

Acton, Ont.
Smith & Wright, 2945 Dundas St. W., have been appointed architects to prepare plans for a factory costing $15,000 for Thompson Motor Supplies Ltd., 415 Queen St. W., Toronto. Tenders will be called by owners.

Capreol, Ont.
H. Plexman will shortly build a theatre costing $8,000.

Cedar Springs, Ont.
G. Claus & F. Pardo have been appointed architects for a $10,000 garage and auto repair shop.

Hickson, Ont.
$10,000 garage and service station contemplated by Peter Jackson, c/o Mrs. A. E. Roth, Tavestock, Ont.

Montreal, Jue.
Phoenix Bridge & Iron Works Ltd., 83 Colborne St., has the contract for steel for the store being built by Archambault & Leclaire for Dupuis Freres Ltd. The contract for roofing has been awarded to McFarlane & Douglas, 34a Dorchester St. West. Architectural iron work is being done by Vulcan Steel & Iron Works, 1698 St. Dennis Street.

Point Edward, Ont.
Sarnia Cement Products Ltd., Box 21, Point Edward, have commenced rebuilding their plant at a cost of $10,000. Geo. McGee, manager.

Powell River, B. C.
Powell River Co. Ltd.. is having a reinforced concrete chimney costing $25,000 built by the Henie Chimney Co., Chicago, Ill.

Regina, Sask.
Stores and apartments costing $50,000 contemplated by F. Nash, Alexander Hotel, Regina. T. Barnard, 2016 Dewdney St., general contractor, will buy material.

Simcoe, Ont.
Factory costing $40,000 contemplated by the Wilkie Products Ltd. R. W. Wallace, secretary.

Tillsonburg, Ont.
Stephen Scott has the general contract for an addition to a factory for the Tillsonburg Shoe Co., costing $15,000.

Toronto, Ont.
Plans are being prepared for an addition to the factory occupied by Ontario Press at a cost of $10,000. H. C. Hocken, 34 McCaul St., interested.

Bulk and separate tenders are being received by B. Brown architect, 487 Spadina Ave., for a manufacturing building.

McColl Bros. Ltd., Don Esplanade, want tenders on a garage, storage building and offices. Mr. Stanton, manager.

A block of stores with apartments above will be built on North Yonge St., by D. C. Kay, Ashdale Ave.

Geller Bros., 228 Spadina Ave., plan a garage costing $20,000. B. Brown, 487 Spadina Ave., architect.

New tenders may be called next month for a warehouse for S. Frank Wilson & Sons. 73 Adelaide St. West. W. L. Symons, 119 Bay St., architect.

Windsor, Ont.
An addition to a garage for the Universal Garage, Chatham St., will cost about $30,000. J. V. Gray Construction Co., Bartlett Bldg., general contractors, will erect the building.

Winnipeg, Man.
W. Wedley, 363 Banning St., will shortly build a store costing $12,000. W. H. Iverson, 38 Ruby St., general contractor.

CONTRACTS AWARDED

Hamilton, Ont.
MacKay Bros., St. Eloi Apts., have the general contract for a store costing $13,500.

Mimico, Ont.
Contracts for a $30,000 factory for the W. E. Shenstone Co. London, Eng., awarded as follows: Masonry, H. N. Dancy & Son Ltd., 22 College St.. Toronto; steel, Canadian Allis-Chalmers Ltd., King St. W., Toronto; steel sash, Canadian Metal Window & Steel Products, 160 River St., Toronto.

Montreal, Que.
W. H. Murray, 223 Grand Boulevard, has the general contract for a manufacturing building for R. White & Co., 636 Craig St., costing $25,000.

Port Arthur, Ont.
The general contract for a terminal elevator for N. Bawlf Grain Co. Ltd., Winnipeg, Man., has been awarded to Carter. Halls Aldinger Co., Union Bank Bldg., Winnipeg. Man.

Thetford Mines, Que.
Phoenix Bridge Co., 83 Colborne St., have the contract for steel for the asbestos mill. Roofing contract awarded to Metal Shingle & Siding Co. Ltd., 91½ Delorimer St., Montreal.

Toronto, Ont.
Creber, Son & Co., 1333 St. Clair Ave. West, have the general contract for a store and six apartments costing $30,000.

Norman McLeod Ltd., Kent Bldg., has the general contract for an addition to the Star Publishing Company's building at a cost of $8,000.

Contracts awarded on the Ford Assembly plant, Danforth Ave., are: Cut stone, Ritchie Cut Stone Co., 191 Grant Ave., Hamilton; Ornamental Iron, Canadian Wire & Iron Works, 180 King William St., Hamilton; plastering, R. C. Dancy, 57 Kendall Ave., Toronto; Marble & Tile, Italian Mosaic Tile Co., 429 Spadina Ave., Toronto; Kalamein Floors, Kalamein Floors Co., Chicago, Ill.; steel stack, John Inglis Co., Ltd., Strachan Ave., Toronto.

Residences

Guelph, Ont.
Dwellings costing $7,000 proposed by Prof. Stevenson and Prof. Springer of the O. A. C.

Hamilton, Ont.
Ramier & Langer, 109 Gladstone Ave., propose to build three residences costing $18,000.

A dwelling costing $33,000 is being built for M. H. Levy, Markland St., by J. R. Isbester, 125 Wellington St. south.

Dwelling costing $9,000 being built by J. Berwick, 92 Pearl St. north.

Hillsburg, Ont.
Waldie, Steen & Hillburg, via. Erin, Ont., will build a residence costing $8,500.

London, Ont.
Harold F. White, 831 Dundas St., contemplates a residence costing $7,000.

Moncton, N. B.
G. V. Steeves, Park St., is adding a wing to an apartment house at a cost of $20,000.

Montreal, Que.
An $8,000 residence is planned by Max Jarry, owner & Builder, 2082 St. Lawrence Blvd., who will let all sub-trades.

Lancashire Land & Construction Co., 445 Oxford Ave., contemplates 12 semi-detached residences.

Residence costing $12,000 contemplated by G. Chasse, 413 Latourneaux St., No material purchased.

Montreal West, Que.
A. Payne & Co., 30 Westminster Ave., contemplate building a double semi-detached residence and a cottage at a cost of $30,000.

Oshawa, Ont.
Tenders are wanted on a residence costing $12,000 for John Burns, c/o Ellis, Ellis & Richardson, Manning Chambers, Toronto.

E. A. Everson, owner and general contractor will shortly build a residence costing $6,000. No material purchased.

Ottawa, Ont.
R. W. White, Bronson Ave., plans a residence costing $11,000.

Point Grey, B. C.
John Galloway & Sons, 116-7th Ave. east, Vancouver, will shortly commence work on a residence for Mrs. A. Harvey, 3562-5th Ave west, Vancouver.

E. Chrystal & Co., 108 Georgia St. east, Vancouver, are building a residence costing $21,000 for Dr. T. B. Anthony, 736 Granville St., Vancouver.

The A. Rodger Contracting Co., 715 Pacific Bldg., will shortly build a $13,000 residence for Allan D. Desbrisay, 601 Bute St., Vancouver.

Sam. N. McLeod, 2857-5th Ave., will build a $14,000 residence for Fred Perkins, 1375 Nanton St., Vancouver.

Rockhaven, Sask.
A. Werehahn has the foundations in for a residence costing $5,000.

St. Boniface, Man.
A residence costing $7,000 will be built

for Hince & Rodrigue, 229 St. Mary's Rd., by R. Corbeil, 14 Hamel St.

St. Catharines, Ont.

Tenders are being received by Nicholson & MacBeth, 46 Queen St., for a residence costing $9,000, for W. A. Black, 21 James St.

Simcoe, Ont.

C. H. Finck and Wm. Sutton, Simcoe, are Building a double residence costing $6,000.

Toronto, Ont.

A. G. Saunders, 234 Wychwood Ave., has evcavated for a pair of residences to cost $12,000.

Jack & Awde, 232 Armadale Ave., are excavating for a residence and garage for W. R. Willard. Building will cost about $15,000.

A. A. Hobson, 70 Hilton Ave., has excavated for a $30,000 residence. Sub-trades to be let.

A. E. Pelton, Listowel, contemplates building two residences costing $10,000.

A. L. Sanagan, builder, 3 St. Leonards Ave., is building a residence costing $8,000.

A. L. Sanagan, 3 St. Leonard's Ave., intends to build a dwelling costing $10,000.

Two residences costing $8,000 each planned for A. L. Sanagan, 3 St. Leonards Ave. Owner will call tenders on all trades.

Harry Jennings, 49 St. Clair Ave. west, is excavating for a $7,500 residence for Wm. Britnell, 93 Summerhill Ave.

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W. J. Pickering, 28 Willard Ave., has excavated for a dwelling costing $7,500. Tenders being received on small trades.

Four residences, each costing $6,000 may be built this spring by W. H. Raine, 7 Glencairn Ave.

H. C. Roberts, 7 Runneymede Road, plans to build eleven residences on Well's Hill Ave.

W. D. Shanks, 195 Broadview Ave., intends to build a dwelling costing $7,000.

V. O. Puttock, 20 Grassmere Ave., is receiving tenders on a residence costing $8,500.

Grimshaw Bros., 1176 Danforth Ave., are having plans pepared by P. L. Davis, 309 Gerrard St. east, for a residence costing $12,000.

A $7,000 residece is being built by Walter Osborne, 144 Glengrove Ave. E., for H. C. LeFroy, 171 Glengrove Ave. E. Sub-trades to be let.

Wm. H. Hurley, 46 Gormley Ave., is excavating for a $7,000 residence for Rev. S. T. Bartlett, 24 Dalton Rd. Sub-trades to be let.

Grimshaw Bros., 1176 Danforth Ave., are having plans prepared for a residence costing $23,000.

I. Hopkins & Son, 498 Main St., contemplate building nine residences this year.

Vancouver, B. C.

H. Kollhammer, owner and builder, has excavated and is building a residence costing $22,500.

Valleyfield, Que.

A $13,000 cottage to be built by J. O. Chasle, J. O. Turgeon, 55 St. Francois Xavier St., Montreal, architect, No material purchased.

Walkerville, Ont.

T. Wallace, 434 Bruce Ave., has excavated for a residence and garage costing $7,000.

A $6,000 residence and garage is being built for E. J. Clegg, 71 Ottawa St., by John Catlin, 330 Lincoln Rd.

Windsor, Ont.

Four family residences costing $12,000 will be built by E. J. & R. H. Baby, P.O. Box, 48.

H. Winch, 433 Church St., is building a $14,000 residence for J. C. Lanford, 18 Victoria Block, c/o Dawson & Smith.

Winnipeg, Man.

Dwelling costing $9,500 will be built by S. Gilason, 706 Home St. Winnipeg.

$6.000 residence proposed by H. Nick, c/o A. B. Desrochers, general contractor, 456 Stella Ave., Winnipeg.

L. Heany, 398 Furby St., has the foundations in for a residence costing $6,000

CONTRACTS AWARDED

Hamilton, Ont.

A. Williamson, 469 King St. east, has commenced work on a residence costing $15,000. Contract for masonry let to Medley Bros., 495 Wilson Ave.

Montreal, Que.

Contracts on a $35,000 dwelling being built for K. G. Rea by A. F. Byers & Co. Ltd., University St., let as follows: Steel, Dominion Bridge Co. Ltd., Lachine; roofing, Metal Shingle & Siding Co., 91 Delorimer Ave.; plumbing and heating, J. A. Gordon, 301 St. Antoine Street.

The general contract for an apartment house in which P. DuTremblay, c/o La Presse is interested, has been awarded to Anglin-Norcross, 65 Victoria St.

Forty-eight residences will be built by Badgley Construction Co., 84 Mark St. Contracts have been awarded as follows: Concrete and brickwork, Jules Toralli, 186 St. Margaret St.; roofing, Belisle & Freres Ltd., 225 Chambord St.; plumbing and heating, J. Tweedle & Co., 163 Lagauchetiere St.

Outremont, Que.

L. Carta, 42 College St., has the general contract for residences costing $25,000 for C. M. Lesage, 116 Laurier Ave.

Toronto, Ont.

F. Harrison, 366 Bay St., prepared plans for a $25,000 residence for E. L. Ruddy, 317 Spadina Ave. The plastering contract was awarded to Robertson & Findlay, c/o architect.

Power Plants Electricity and Telephones

Drummondville, Que.

Southern Canada Power Co. Ltd., 20 St. Nicholas St., Montreal, is building a transmission line from Drummondville to Richmond.

Southern Canada Power Co., 20 St. Nicholas St., Montreal, proposes to build a transmission line from Drummondville to Melbourne which will cost about $200,000.

London, Ont.

Utilities Commission, E. V. Buchanan, General manager, contemplate Hydro-electric sub-stations costing $77,000.

Wallaceburg, Ont.

Ontario Power Commission, 190 University Ave., contemplate an extension

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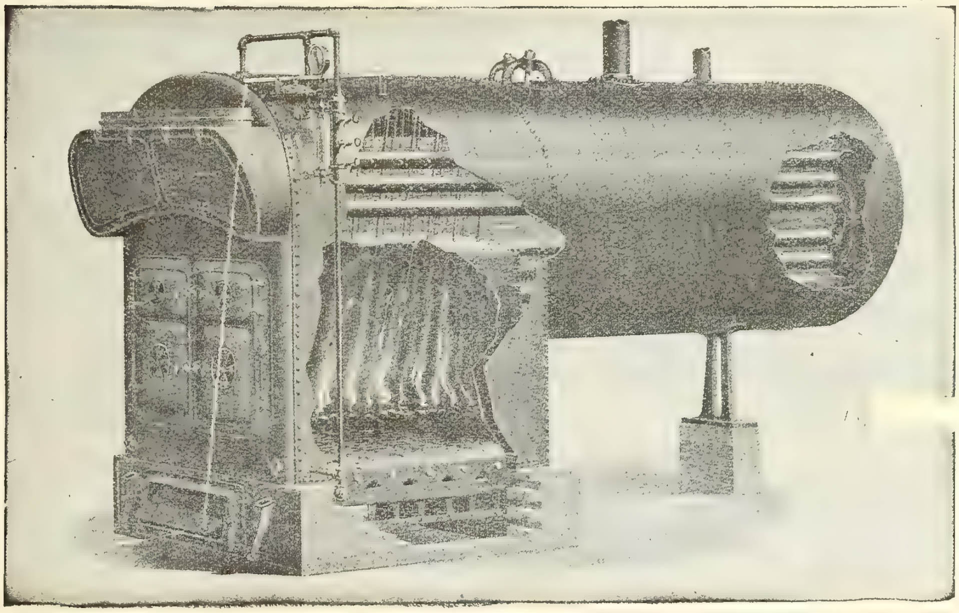

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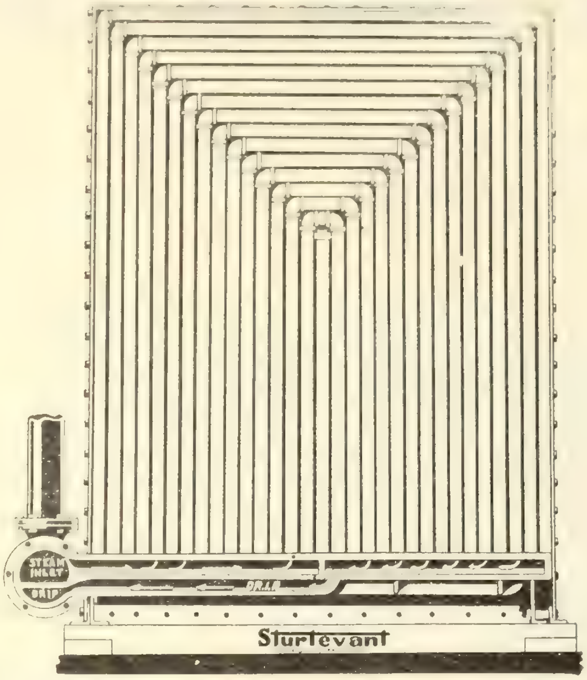

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Miscellaneous

Hamilton, Ont.
Tenders will be called for painting the basement, walls and ceiling, etc., of the City Hall. S. H. Kent, clerk.

CONTRACTS AWARDED

Estevan, Sask.
A $20,000 mechanical coaling plant will be built for the Canadian Pacific Railway by A. E. Hamilton, Moose Jaw, Sask.

Red Deer, Alta.
Vickers Construction Co., Vancouver, B. C., have the general contract for a coaling plant and culverts for the Canadian Pacific Rly., at a cost of $18,500, at Red Deer, Lacombe and Wetaskiwin.

Late News

Cayuga, Ont.
Stewart Bros., 3 Hyde Park Ave., Hamilton, have the general contract for the $100,000 Court House and Jail.

Hamilton, Ont.
The general contract for a pipe sewer for the City has been awarded to J. D. Armstrong, 871 Main St. East.

Alterations planned to the Proctor Gamble building costing $10,000, include another storey. Tenders are being received by the owners and no closing date has been set.

Plans for an $18,000 residence are being prepared for Mrs. G. Hope by Husband & Robertson, 30 Bank of Montreal Bldg., Hamilton.

London, Ont.
"Tecumseh" barracks, owned by the Department of Militia, destroyed by fire at a loss of $50,000.

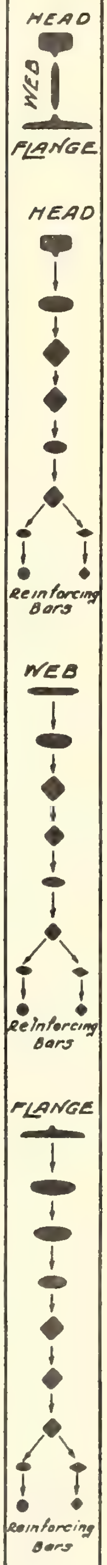
Moncton, N. B.
Extension of the radial line from Moncton to Sunny Brae proposed by the Moncton Tramways, Electricity & Gas Co., 38 Mechanics St., Moncton. E. A. Cummings, manager.

Montreal, Que.
A. F. Byers & Co. Ltd., 340 University St., have the general contract for a warehouse for Drummond & McColl & Co. Ltd., 28 Victoria Sq., estimated to cost $170,000.

Port Hope, Ont.
Sewers on several streets contemplated this year by the Town Council. J. W. Sanders, clerk.

St. Raymond, Que.
Tenders, closing in May, are being received by Jas. G. Moisan, secretary of the Council, for a $250,000 waterworks system. Work is expected to proceed in the spring. Eugene Lapointe, Baie St. Paul, Co. Charlevois, engineer.

Stratford, Ont.
Paving planned by the City Council included 35,000 sq. yds. of concrete, asphalt surface 6" thick and 32,000 lineal feet of curbs and gutters. Tenders are being received by A. B. Manson, engineer, until Apr. 28.



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B B

Current Prices of Building and Engineering Materials

		Toronto	Montreal	Winnipeg	Vancouver
CEMENT (Delivered on job):—					
Retail lots including bags	per bbl.	$4.60	$4.16	$4.80	$3.70
Car lots, including bags	per bbl.	3.60	3.48	4.20	3.35
Refund on bags	each	.20	.20	.20	
LIME (Delivered on job):—					
Lump, in retail lots	per ton	14.30	14.00	.58 bu.	2.70 bbl
Lump, in car lots	per ton	12.70**	11.00	13.80 ton*	2.60 bbl
Hydrated, white in retail lots	per ton	20.00	26.00	.63 bag*	30.00
Hydrated, white in car lots	per ton	19.00	21.00	.56 bag*'	25.00
Hydrated, grey in retail lots	per ton	18.75	17.75		
BRICK and TILE (Delivered on job):—					
Common face brick	per M.	24.00	16.50*	19.00	30.00
No. 1 dry pressed brick	per M.	31.00	30.00	36.00	70.00
No. 2 dry pressed brick	per M.	29.00	25.00	32.00	
Enamelled brick	per M.	125 up to	230.00	185.00	150.00
Wire cut brick, for foundation work	per M	21.00	19.00		50.00
Sand lime brick	per M	17.00		18.00	
Hollow building tile	per M.			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	60-95	60-75	85-100	80.00
Fire clay	per ton	13-20	15-16.00	35.00**	22.00
STONE, SAND and GRAVEL (f.o.b. cars on siding):—					
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.00 yd
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 "	" "
Crusher run	per ton	2.20½		3.00 "	" "
Rubble stone	per ton	2.45	1.70	15.00 cord	" "
Gravel, 2 in. screened	per ton	2.05		2.45 yd.	" "
Gravel 1 in. screened	per ton	2.31	1.50	2.75 "	" "
Sand, screened	per ton	1.42½	1.25	1.90 "	" "
Pit run	per ton	1.52¾	1.25	1.90 "	" "
STEEL and IRON (f.o.b. warehouse):—					
Mild steel bars, ¼ in. and heavier	per 100 lbs.	3.75 base	3.50 base	4.60	4.00
Bands 3/16 in. and lighter	per 100 lbs.	4.25 "	3.50 "	5.10 base	
Hoops	per 100 lbs.	5.00 "	4.50 "		
Twisted and deformed bars	per 100 lbs.	3.75 "	3.50 "	4.55	4.00
Angles, channels and tees under 3 in.	per 100 lbs.	3.90 "	3.75 "	5.35	6.00
Structural shapes	per 100 lbs.	4.00 "	3.75 "	5.05 base	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.40 "	3.75 "	5.15	6.25
Plates—3/16 in.	per 100 lbs.	3.60 "	4.10 "	5.55	6.50
Plates—10 gauge	per 100 lbs.	4.40 "	4.50 "	5.45	6.50
Black sheets—28 gauge	per 100 lbs.	5.50 "	5.00 "	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.90	7.00	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	6.65 "	7.00 "	7.70	8.25-8.50
Rivets	per 100 lbs.	6.25 "	6.00 "	7.00 base	
Cast iron pipe	per ton	65.00	60.00		
VITRIFIED CLAY PRODUCTS (Delivered on job):—					
Sewer pipe, 4 in.	per ft.	.40	.30	.35	.38
Sewer pipe, 6 in	per ft.	.60	.45	.45	.48
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.55
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.70
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.85
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00	.90	.65	.75
Chimney tops	each	9.00	3.50–5.00	7.50	4.50–6.00
Discounts		45 % truck lots 50 % car lots	20 % 50 %	5 %	

CEMENT:—*Discount of 10 cts. per bbl. in 20 days. Price f.o.b. cars is $8.75 †Subject to 5% discount. **Excluding bags.
LIME:—*Discount of 5%. †Bag of 50 lbs. **Price f.o.b. cars is $11.70.
BRICK AND TILE—*f.o.b. plant.
STONE SAND AND GRAVEL:—*Winnipeg prices subject to 5% disco **Toronto prices include sales tax.

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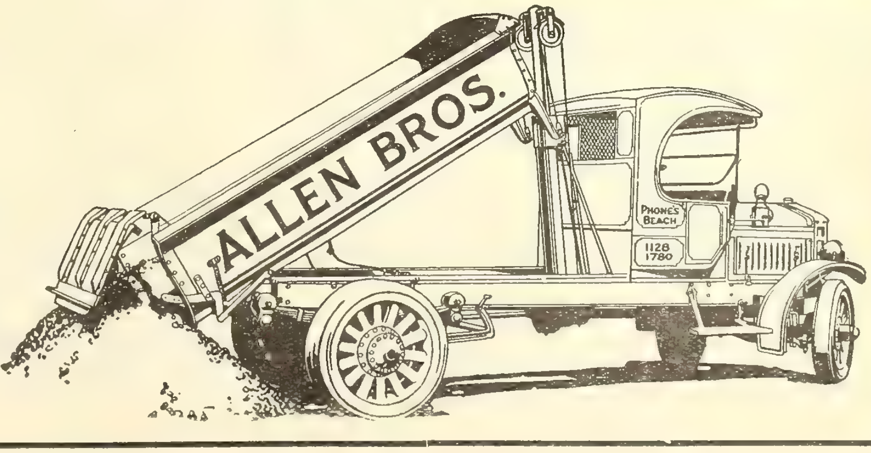

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Lumber (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver*
Flooring, 1 x 3 and 4 in., clear, E. G. fir	per M.	90,00	60.00	94.50	55.00
Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	70.00	65.00	63.00	30.00
Flooring, No. 1 pine	per M.	70.00	80.00	64.80	
Flooring, No. 1 Spruce	per M.	48.00	45.00	40.50	
Flooring, birch and maple, 13/16 in. clear	per M.	130.00	110.00	171.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	130.00	125.00	157.50	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	70.00	65.00	63.00	30.00
V joint, No. 1 pine	per M.	70.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	43-58	45.00	67.50	
Red and Jack Pine, 2 x 4 to 12 in., com. rough	per M.	44/58	70.00	40.50	
Hemlock, 2 x 4 to 12 in.	per M.	42/45	40.00	42.50	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	40-50.00	50.00	38.70	11.00-13.50
Spruce, 1 and 2 x 4 to 12 in.	per M.	44/58	45-35	38.70	
Timbers, fir, 10 x 10 in. and up	per M.	65.00	58.00	55.00 base	17.-22.00
Lath, No. 1 white pine	per M.	16.00	12.00	12.60	
Lath, M. R. spruce	per M.	10.00	8.50	11.25	7.00
Shingles, XXX B.C. cedar	per M.	6.50	5.00	6.30	3.40
XX B.C. cedar	per M.	4.50	4.25	4.50	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	115.00	55.00
Fir casing	per M.	1 ct. per in.	100.00	115.00	
PAINTS, OILS, COLOURS (delivered):—					
White lead ground in oil, less than ton lots	per cwt.	14.55	13.75	15.60	15.80
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	22.00
Putty in bulk	per cwt.	5.95	4.25	5.50	9.25
Steel sash putty in bulk	per cwt.	6.45	6.00	8.00	7.75
Boiled linseed oil, in bbls.	per gal.	1.28	1.18	1.26	1.28
Raw linseed oil, in bbls.	per gal.	1.25	1.15	1.23	1.25
Turpentine, in bbls.	per gal.	2.25	2.00	2.50	1.60
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 9/10	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 4/5	.45
PLASTER (Delivered):—					
Hard wall plaster, sanded	per ton	13.50	15.00	25.40	30.00
Plaster of paris, in bbl. lots	per bbl.	6.00	5.35	1.60 bag*	7.50
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu.	1.50
LABOR:—					
Bricklayers	per hr.	1.00	.80-.90	1.15	1.06¼
Structural Iron Workers	per hr.	.85	.50-.75	1.25	1.00
Plasterers	per hr.	1.00	.80	1.05	1.06¼
Hoisting Engineers	per hr.	.70-.80	.50	.90-1.10	1.00
Plumbers	per hr.	.90	.60-.75	1.00	.90
Carpenters	per hr.	.80	.65	.90	.81¼
Painters	per hr.	.75	.55-.65	.80	.81¼
Electrical Workers	per hr.	.80	.65	.70- .90	1.00
Roofers	per hr.	.65	.65		.90
Laborers	per hr.	.40-.50	.30	47½-.55	.50-.56¼
Sheet Metal Workers	per hr.	.75			.90

LUMBER:—*Owing to the general unstable condition of the present lumber market, Vancouver dealers refuse to quote any prices at all especially for Prairie or Eastern publication. The prices are, moreover, fluctuating from day to day Such prices as we quote are, therefore, averages and not standard

PLASTER *Including bags.

Cyclone Churn Drills

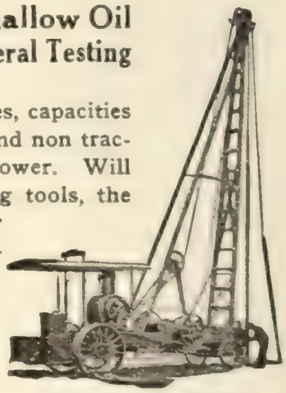
For Blast Hole, Water, Shallow Oil and Gas Well Drilling and Mineral Testing

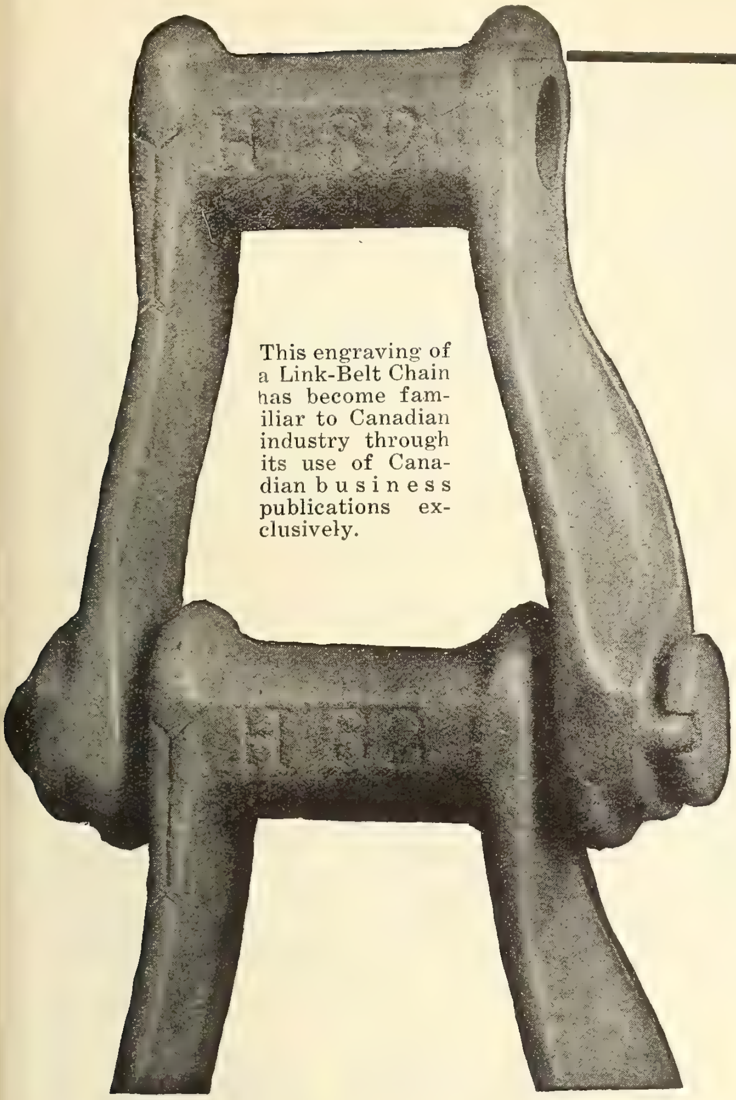
The No. 14 Cyclone Blast Hole Drill is a machine especially designed and constructed for drilling blast holes in quarries, open pit mines and for heavy rock excavation. Built in two sizes in both traction and non traction types with gasoline, electric or steam power. Covered in our Catalog B-45.

Cyclone Well Drills are built in 5 sizes, capacities 200 to 2000 feet and in both traction and non traction types with gasoline or steam power. Will operate cable and hollow rod drilling tools, the latter by either the self-pumping or jetting process. Well Drills are described in our Catalog A-70.

The Sanderson-Cyclone Drill Co., Orrville, Ohio, U.S.A.

Mussens Ltd., Canadian Representatives — Montreal, Toronto, Winnipeg and Vancouver





This engraving of a Link-Belt Chain has become familiar to Canadian industry through its use of Canadian business publications exclusively.

"I cannot speak too highly of the results we have obtained through consistent use of large space in business papers"

Julius Holl, Advertising Manager.
Canadian Link-Belt Company, Limited.

◆

The Link-Belt Company is among the largest manufacturers of elevating, conveying and power transmission chains, coal and gravel washing machines, ash handling equipment, locomotive cranes and similar products. Their problem is to sell to many diversified industries and they use established business papers with extraordinary results.

What Link-Belt have done you can do also by placing your Sales Message in a publication that reaches your definite prospects in a business-like manner.

An advertisement in a business or technical newspaper reaches a specific trade or industry without circulation wastage among readers who have no particular interest in the goods you sell.

Some of the most successful advertising campaigns in Canada of recent years have used trade, business and technical periodicals, either exclusively or as the foundation for a more general appeal.

The advantages of being able to reach a known prospective buyer through a publication he uses in his business cannot be over-estimated.

Use CANADIAN Plaster

BUT SPECIFY

"HAMMER" BRAND

Hard Wall Plaster
Calcined Plaster

Manufactured by

ALBERT MANUFACTURING CO.
HILLSBOROUGH, NEW BRUNSWICK

Our plasters have stood the test of time for over fifty years

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Hydrated Lime Banner Brand

Manufactured from the Celebrated Guelph White Lime

High Calcium Lime for Chemical Purposes

Manufactured at Beachville

Crushed Stone, all Sizes

Crushing Plant at Beachville

Standard White Lime Co. Limited

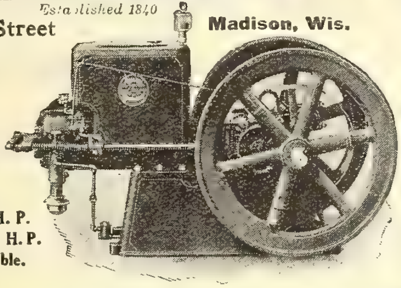
Head Office: GUELPH **Plants: Guelph Beachville St. Marys**

USE
FULLER & JOHNSON
EASY TO START
ENGINES

THE CONTRACTOR DEMANDS an engine that will stand up under hard, continuous work. For this reason our Model "N" Gasoline Engine was designed with extra long bearings; long piston with leak proof rings carefully fitted to a semi-steel cylinder, insuring good compression even after the engine has been in use for many years; perfect balance that results in smooth, quiet running; a liberal margin over rated power. Many other features contribute toward making the Model "N" just the right engine for the contractor. Catalog 21A will give you full information.

Write for it today.

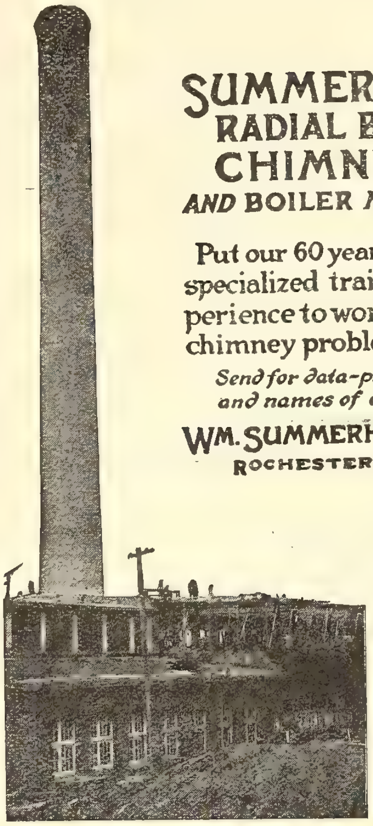
FULLER & JOHNSON MFG. Co.
Established 1840
33 Cedar Street Madison, Wis.



Built in sizes
1½, 3, 5, 7, 9, 12 H. P.
Other models up to 25 H. P.
Stationary or Portable.

This engine fills the contractors' requirements.

EASY TO START



SUMMERHAYS
RADIAL BRICK
CHIMNEYS
AND BOILER MASONRY

Put our 60 years of highly specialized training and experience to work on your chimney problems

Send for data-photographs and names of customers

WM. SUMMERHAYS SONS
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109 Place D' Youville
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A. G. Hill
45 Jarvis St.,
Toronto, Ont.

Canadian-Connecticut Cotton Mills, Limited.
Sherbrooke, Que.

Pays for itself on one small job

Heart-Shaped Mixer with Automatic Dumping Device

Illustration shows No. 3 and 4 heart-shaped mixer, back view, with Automatic Loading Hopper discharging into Drum, with throw-out clutch which allows you to use engine for pumping, hoisting and other classes of work.

By its labor saving facilities, adaptability and high speed, this mixer earns its place on every job. The Automatic Dumping Device allows you to discharge a shovelful, wheelbarrowful or the whole batch if required. Of rigid strength and construction with steel channels and angles, Semi-Steel Castings, and equipped with a throw-out clutch which enables the engine to be started independent of the mixer, and so used for hoisting or pumping water. Drum holds 10 cubic feet and 13 cubic feet. Capacity 100 and 130 cubic yards per day respectively. Send for catalogue.

WETTLAUFER BROS. Limited
178-180 SPADINA AVE. :-: TORONTO, CAN.

Crushed & Screened SAND and GRAVEL

Entire product passes through crushing and screening plant; is exceptionally clean and free from all foreign matter; any size from sand to 2½″ stone can be furnished.

The McArthur Engineering & Construction Co. Limited
Office: 15 Douglas Street, GUELPH, ONT.

Why You Can Be Sure of Delivery of

SAND LIME BRICK

Contractors and architects who order from us do so with the knowledge that their order will be filled **on time.** We guarantee this service by keeping a reserve stock constantly on hand and will not accept orders that will deplete this reserve. This means that you get delivery when you want it.

Quality—the finest ***Prices—right***

Harbour Brick
Company Limited
LUMSDEN BUILDING
Phone: Main 3315
Yard: Foot of Bathurst St., Toronto
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You believe

In the use of *Canadian Materials*

Queenston Blue Dolomite

A Canadian Stone
of
Superior Quality and Color

Will not Stain
Retains its Bright Clean Appearance

Ashlar, Dimension Blocks, Sawn Slabs, Sawn Dimension and Cut Stone.

Estimates cheerfully furnished
Send for samples and prices

Queenston Quarries Ltd.
St. Davids Ont.

CRUSHED STONE LIME SAND

STANDARD LIME COMPANY
LIMITED

JOLIETTE, QUE.
LARGEST PRODUCERS OF LIME IN CANADA

PLANTS

CRUSHED STONE
JOLIETTE, QUE.
C.N.R. & C.P.R.

LIME
JOLLIETTE and ST. MARC, QUE.
C.N.R. & C.P.R.

SAND
ST. FELIX DE VALOIS, QUE.
C.P.R.

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Rough Stock - Monumental
Building - Paving Blocks

BRODIE'S LIMITED
128 Bleury St.
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Stanstead, Ebony and Brodie's Pink Granites

Quarries at:—Graniteville, Mount Johnson, and Guenette, Que.

Stock of Paving Blocks always on hand ready for immediate shipment

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PARIS SAND & GRAVEL COMPANY

Washed Concrete Sand
Dry Screened Concrete Sand
1″ Washed Screened Gravel
2″ Washed Screened Gravel

We make a speciality of Pit Run Gravel, in fact we can give you what you want.

Capacity 30 cars per day.

RURAL ROUTE No. 2
PARIS, ONT.

Largest and Best Equipped Plant in Ontario

As evidence of our desire to give customers the highest grade product and the best service, we have installed the most modern equipment known to the industry.

A daily output of 3500 tons is being achieved and the stone, all sizes, comes clean and even in size.

Write, wire or phone your orders for quick action

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DUNDAS Limited ONTARIO

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Specialists in Reinforced Concrete

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CONSTRUCTION CO., Limited

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J. A. St. Amour

ELECTRICAL CONTRACTOR

No job too big, or too small for us.

Promptness & Perfect Workmanship

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Telephone Calumet 128 **MONTREAL**

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Roofing, Waterproofing and Sheet Metal

Barrett Specification Roofing

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Telephone Main 829.
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MARBLE MOSAIC

Floors and Walls

ITALIAN MOSAIC & TILE CO.
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OTTAWA, CANADA.

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CROWN" METAL PRODUCTS

Shingles	All-Steel Doors
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ANY KIND OF ROOF—ANYWHERE

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Branch
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for all types of buildings
Write for estimates

King Construction Co. Ltd.
40 Dovercourt Road TORONTO

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MASTIC ASPHALT FLOORS

For all classes

Heavy and Continuous Service

Machine Shops, Warehouses, Bridges, Breweries, Railroad Stations, Schools, etc. Our special waterproofing specifications have been used for years by Architects and Engineers.

All information supplied on application.

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CANADIAN RED QUARRIES
and tiles for walls, entrances and hearths.
Briquettes, Metal Lath, Dome Dampers,
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FOUNDATIONS, DOCK WORK
PILE DRIVING, SEWERS
WATER MAINS, ETC.

Gas Building, Windsor, Ontario

REMOVE

an ever present menace from fire by having

THE BENNETT & WRIGHT CO.
Limited

do your Electric Work

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Marble Plastering

HOIDGE

34 PRICE ST. - TORONTO
NORTH 383

Marble Dust Marble Chips

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Marbles, Slates, Terrazzo, Tiles, Mosaics, Ceramics, Onyx, Decorative Marble Works, Marble Memorial Tablets, Altars, Fonts and Mantels a Specialty.

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Field and Drain Tile

Famous Denison load bearing everlasting Tile at money saving prices any season of the year.

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Rigg Cut Stone Co., Limited

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Quick Shipments

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Large assortment of stock sizes on hand
Send for catalogue

Pannill Door Co.
Limited
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Plain and Ornamental Plastering
All Artificial Stones for interior and exterior Architectural Sculptors
Scale Models and Antique Reproduction
Models for Stone, Wood and Metal

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Large Variety of Stock Patterns on hand. Special Models made to Detail.

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WESTERN WATERPROOFING COMPANY
EXPERTS W. W. Co. SERVICE

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New York
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We specialize in

Docks **Foundations**
Canals **Breakwaters**
Harbours **Industrial Plants**

Above illustration shows travelling derrick handling 18-ton concrete blocks for Western Breakwater, Toronto Harbor Improvement Contract

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Head Office: Lumsden Bldg., Toronto

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ROAD WORK
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Welland Ont. - - Phone 314

CONTRACTORS' EQUIPMENT
FOR SALE

We are dismantling the Plant of Moose Mountain Ltd., Sellwood. A partial list of this Equipment includes:

Brick Presses
3—American Clay 4 mould Vertical.

Buckets
1—1 yard New Brownhoist.
1—1 yard Owen slightly used.

Cars
3—Wooden Flats.
3—All steel Flats, 80,000 capacity.

Compressors
1—25 x 15 x 24 Rand Belt driven.
1—25 x 15 x 24 Rand Direct Motor driven.

Cranes
1—4 wheel Brownhoist double drum standard gauge, 60 cycle, Electric Three Ton Capacity.

Crushers
1—36 x 24 Farrel.
1—36 x 48 Buchannan.
1—48" Symons Disc.
1—No. 4 McCully.
2—No. 2 McCully. ....

Drills & Sharpeners
30—Waugh & Leyner Drills.
1—Waugh & Leyner Sharpener.

Pipe
A range up to six inches.

Pumps
A large range of centrifugal and Turbine Pumps.

Rail
A large amount of 20 lb., and 56 lb. Spring delivery.

Shovels
1—70 ton Bucyrus, standard gauge.

Get in touch with us for further details and prices.

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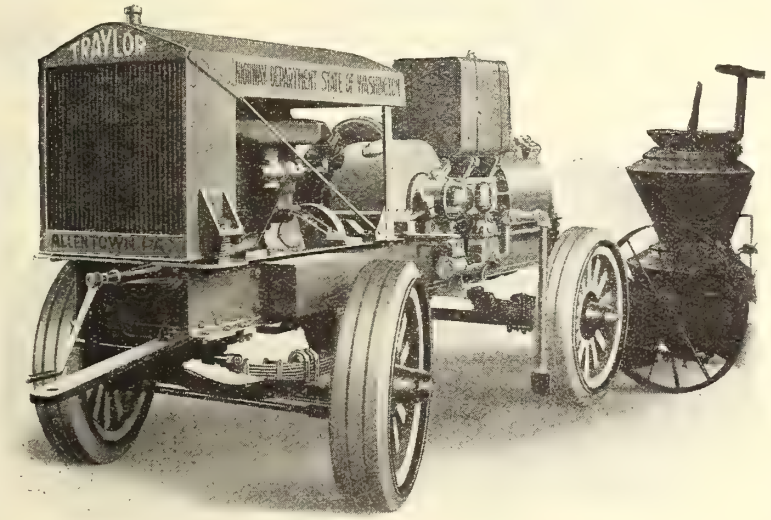
STANDARD CAST IRON PIPE
also
DeLAVAUD Centrifugal Process

All sizes in Stock
for
WATER CULVERT
GAS SEWER
Lake or Rail Shipment

NATIONAL IRON CORPORATION LIMITED
Head Office, Works and Docks TORONTO

Traylor Compressor Shows the Way with New Improvements

From time to time the makers of the Traylor Compressor brought out improvements in its workings until it reached that state of perfection which it maintains today. During the past year, they turned their attention to improving the portability of the machine, with the result shown below—motor truck mounting and rubber-tired wheels.



In this form the Traylor undoubtedly leads the field in this type of equipment. Have you our bulletin on file?

Use the Traylor Portable for all kinds of pneumatic work. It eliminates compressor troubles.

Cement-Gun Company, Inc.
Allentown, Pa.

New York Pittsburgh Chicago Lareodo, Texas
Los Angeles Seattle

Agents in Eastern Canada: General Supply Company of Canada, 356 Sparks St., Ottawa.

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Grader and Drag Blades
also
Scarifier Teeth

Made of high grade plow steel. We carry a stock of about 3,000 blades at all times.

We furnish blades for all makes of road graders. Let us prove to you the merits of our product.

Send us your enquiries.

Manufactured by
SHUNK MANUFACTURING COMPANY
Bucyrus, Ohio

FOR SALE

1—Type O Thew Steam Shovel ⅝-yard dipper on traction wheels.
1—¾-yard Erie Steam Shovel completely overhauled, high lift boom hoist, on traction wheels.
1— ½-yard Clamshell Bucket.
1— ¾-yard Clamshell Bucket.
1—1 -yard Clamshell Bucket.
1—1½-yard Clamshell Bucket.
40—1½-yard two way 24" gauge Western dump cars.
8—4-yard 36" gauge steel under-frame dump cars.
1—25-ton Industrial bucket operating locomotive crane.
20—1½-yard dump wagons.
12—No. 3 wheeled scrapers.
24—Slip scrapers.
1—¾-yard Full Revolving Crane on Caterpillar Traction.

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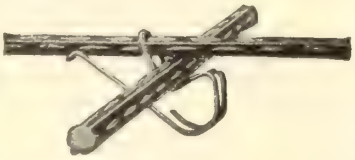
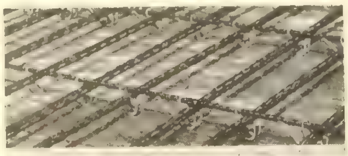
BUILDING D & R SPECIALTIES
DRUMMOND & REEVES Limited

MR. CONTRACTOR
Are you using Ty - Chairs?

Havemeyer
Ty - Chai





The quickest and simplest method yet devised for supporting and tying reinforcing steel.

Let us send you literature and samples for testing purposes, which will prove to you that it is cheaper to use Ty-Chairs than it is to get along without them.

Ask for copy of booklet "A-4"

Drummond & Reeves Ltd.
43 Jarvis Street - - - - Toronto
Telephone Main 331

What Can 2 or 3 Men Do?

A 4-Scraper Train on Road Work

BAKER
MANEY
Self-Loading
FOUR WHEEL
SCRAPERS

Two men and a train of Baker Maney Self-Loading Scrapers can move 300 to 400 yards of dirt a day. Three men handle the longer trains. Good yardage—few men—no teams. The result is the lowest possible cost per yard.

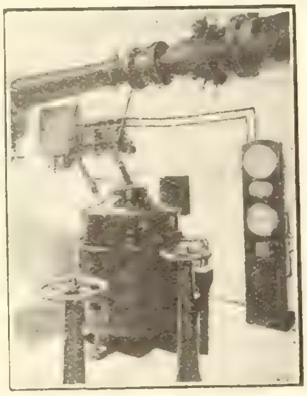
The growing use of Baker Maney Scrapers is due to their doing the work they are sold to do. The extremely strong claims are easy to prove on the job.

Write for Catalog No. 96-A

The Baker Mfg. Co.
560 Stanford Ave.
Springfield, Illinois

Put a Train o' Maneys on your Job

Sewage, Water or Sludge
are easily measured by
THE VENTURI



Venturi Sewage Meter Installation, San Francisco, Cal.

Until 1903 the accurate measurement of sewage flowing through pipe lines was a highly important but unsolved problem which had been given thought by many Municipal Engineers.

In that year a 48-in. Venturi Meter was installed in the Ward Street Sewage Pumping Station of the City of Boston. Its success was not only immediate but permanent.

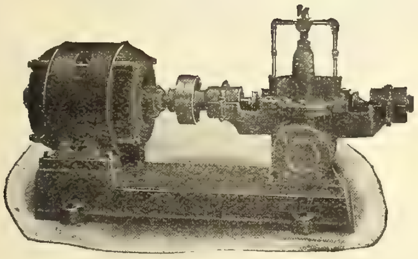
1922 finds hundreds of Venturi Sewage Meters furnishing daily records of sewage disposal plant and pumping station operation, from a 10-inch in the City of Providence to the recently installed 84-inch in Cleveland—**the largest sewer meter in the world.**

If you have problems of flow measurement, our Engineering Dept., will give you the benefit of its experience upon request.

Bulletin No. 181 gives details.

Builders Iron Foundry, Providence, R. I.
Canadian Representatives:
GENERAL SUPPLY CO., OF CANADA, LTD., Ottawa, Montreal, Winnipeg, Vancouver
ALLEN GENERAL SUPPLIES LTD., Toronto, Ont.

A Pump for Every Job



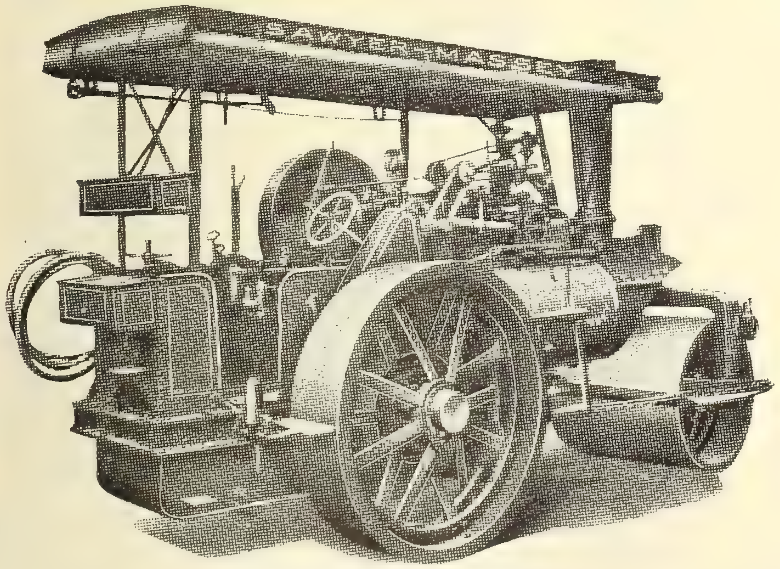
—No matter what pumping problems you are up against —we can certainly help you.

If we know your problem, we can solve it—at low first cost, and low operating cost.

Write us

The
Smart-Turner Machine Co.
Limited
Hamilton - Canada

IF EXPERIENCE IS AN ASSET you are ASSURED of the benefit of it in any ROAD MAKING MACHINERY you purchase from the SAWYER-MASSEY COMPANY



Double Cylinder Steam Road Roller

Our line is complete—
- Portable Rock Crushers.
- Elevators, Screens and Portable Bins, 3 sizes.
- Gravel Screening Plants.
- Road Graders, 4 sizes.
- Scarifiers, heavy and light.
- Road Drags and Road Planers.
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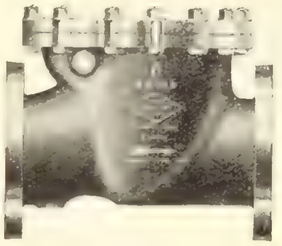

Fig. 481

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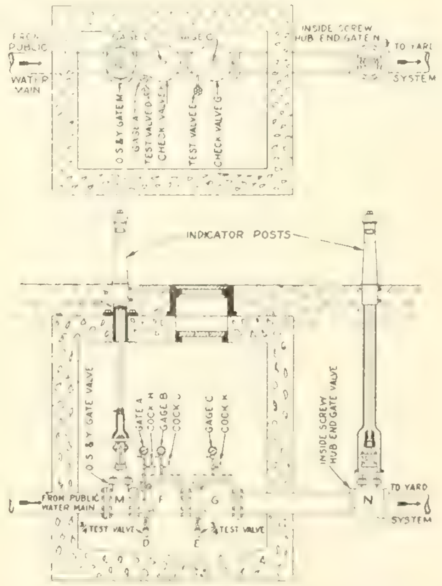

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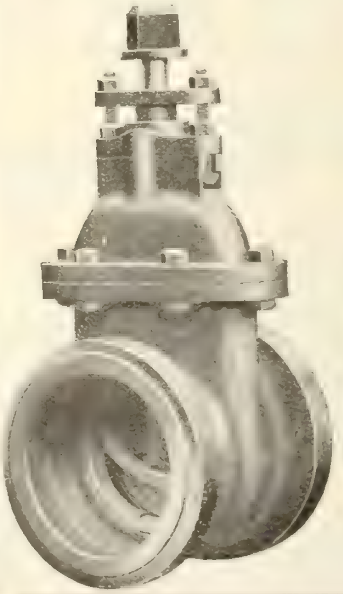

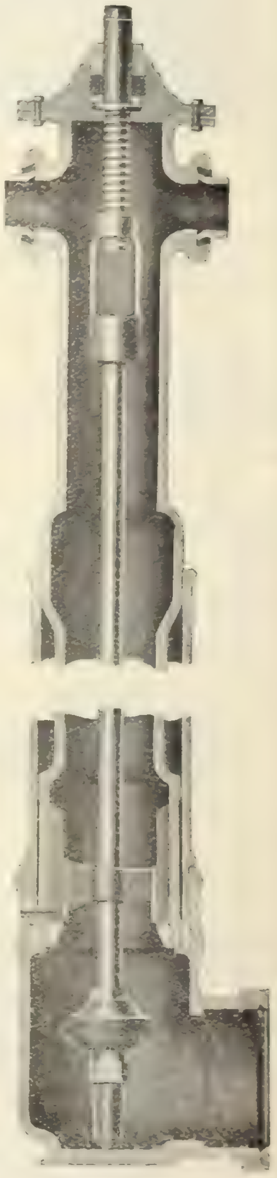

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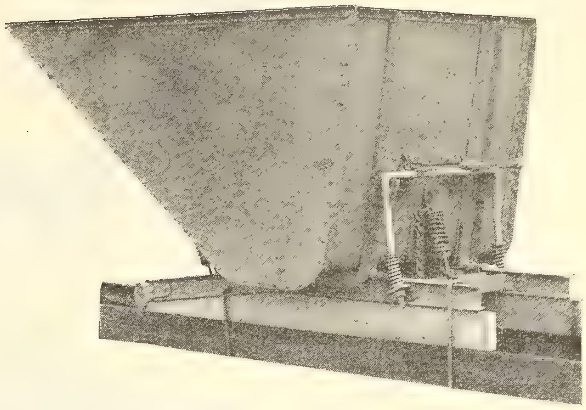

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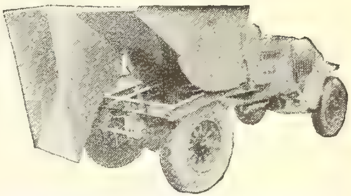

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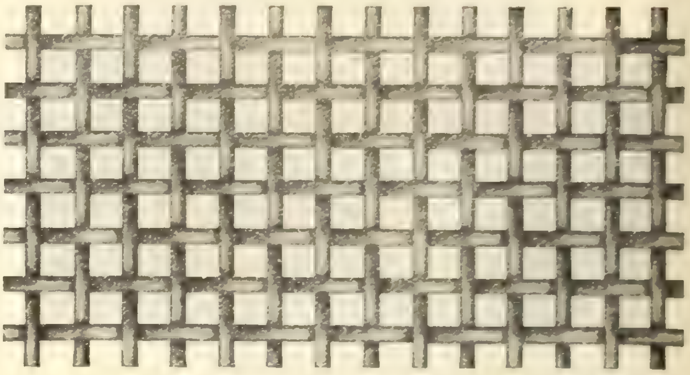

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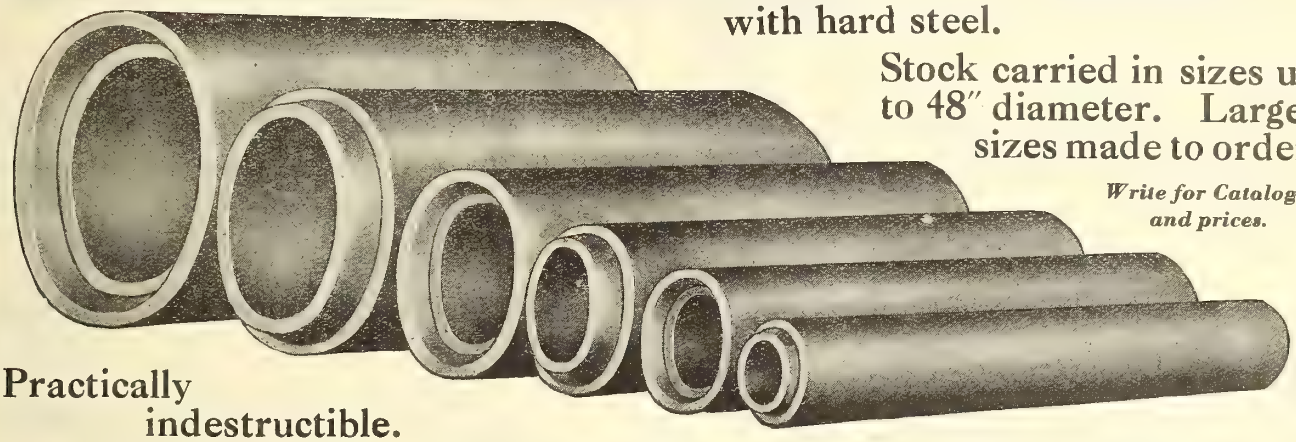

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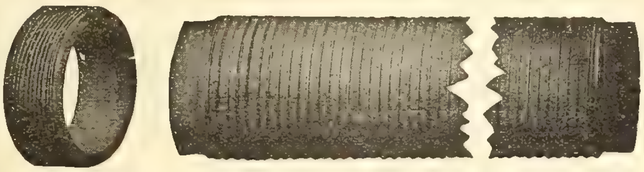

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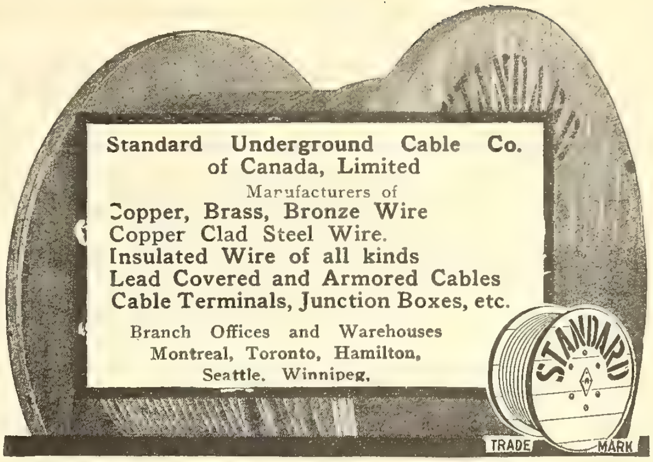

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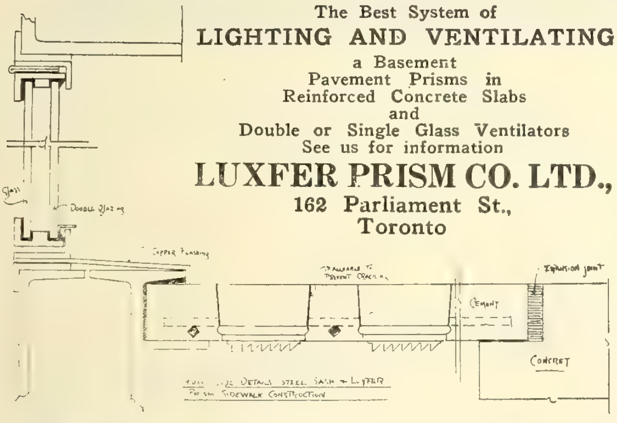

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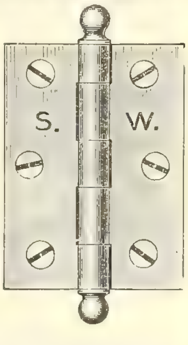

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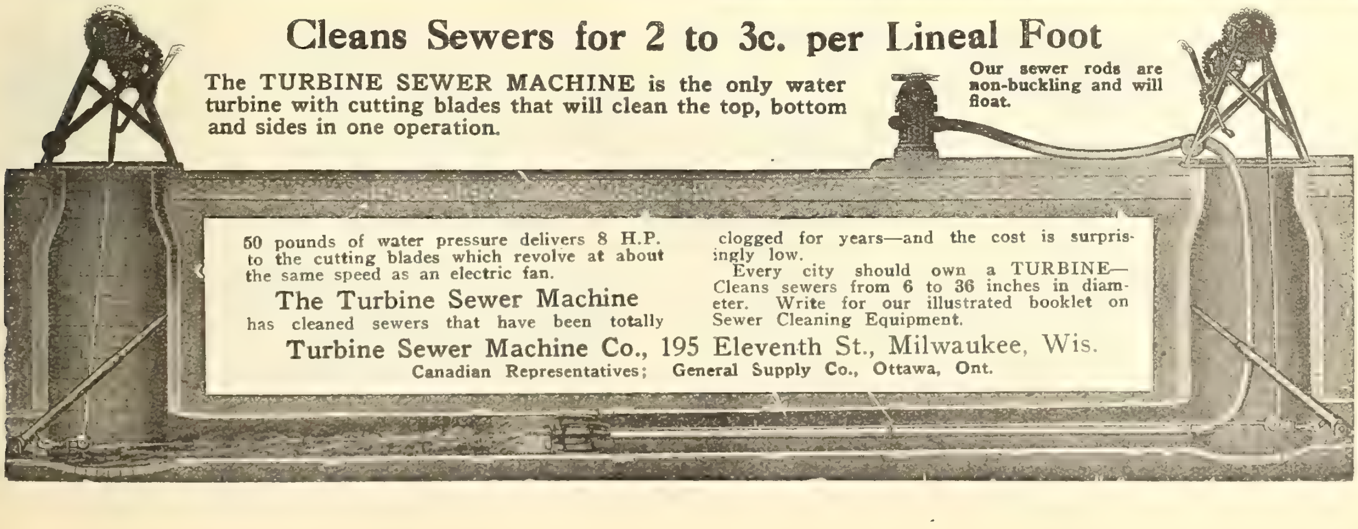

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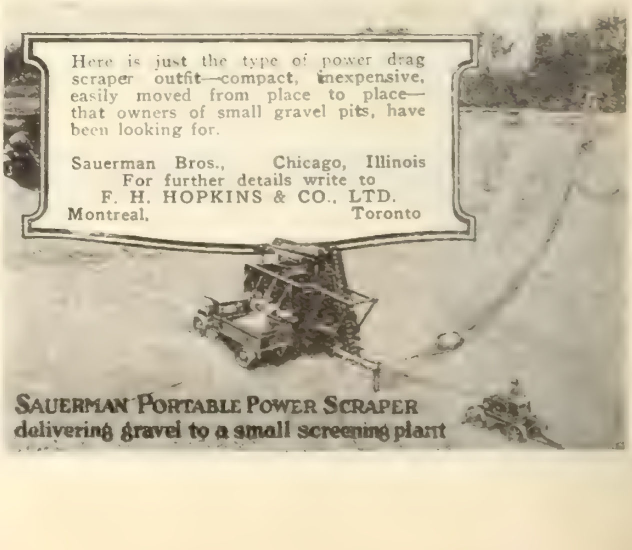

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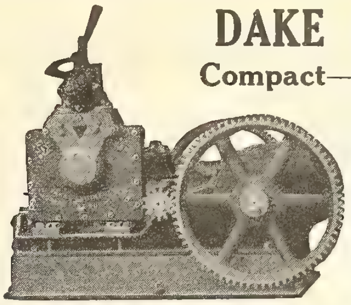

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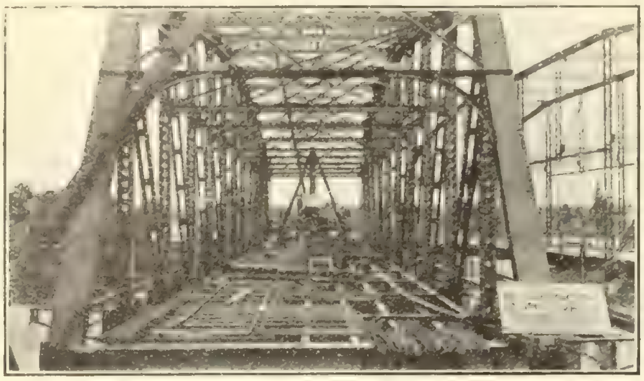

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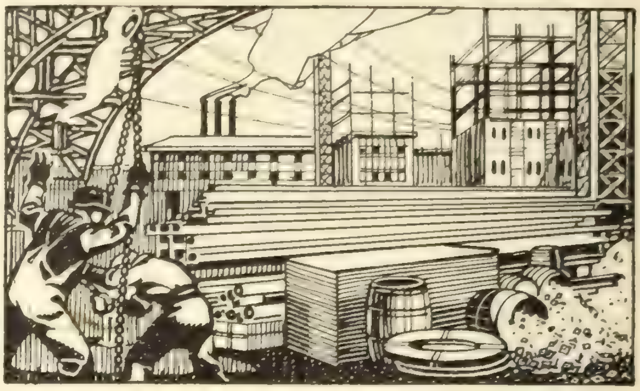

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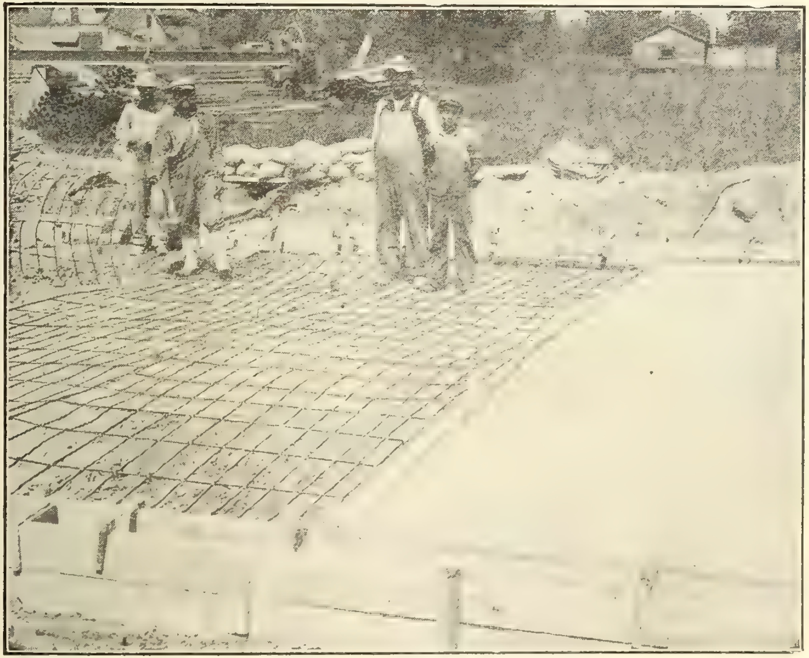

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Niagara Falls, Ont., Canada

ROBERT G. NOLL
Hamilton Ont., Canada

DRUMMOND & REEVES LTD.
Toronto, Ontario

MUSSENS LIMITED
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Faithful

in

Service

The safety of TURNBULL Freight Elevators is an important feature.

Each elevator is equipped, when so specified, with the TURNBULL Safety Gate which prevents accidents at the shaft door where 80 per cent o them happen.

The ideals of service which animate the whole Turnbull organization—integrity, faithfulness in trust, and honest service—are embodied in every Turnbull Freight or Passenger Elevator.

The result of these ideals combined with modern equipment and high-grade material is found in their ability to serve day in and day out without breakdown or delay. If interested, write for particulars.

The

TURNBULL ELEVATOR COMPANY

LIMITED

HEAD OFFICE & WORKS:
John st, TORONTO.

MONTREAL BRANCH:
202 Mappin Building.

"Dominion" Wire Rope

Flexibility and Strength

for the

Stiffest Requirements

Let us quote you for
BLOCKS, CLIPS, THIMBLES AND SHACKLES

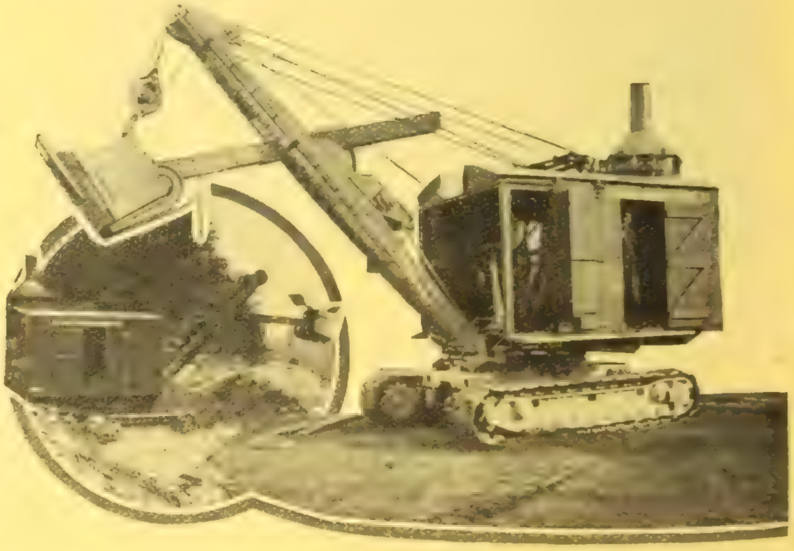
THE DOMINION WIRE ROPE CO., LIMITED

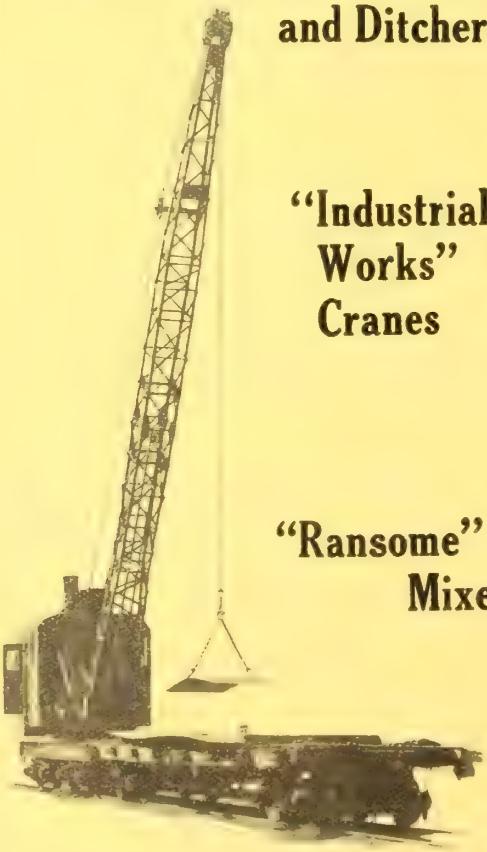
Head Office: WINNIPEG

Also at: TORONTO - MONTREAL

THE BIG THREE!

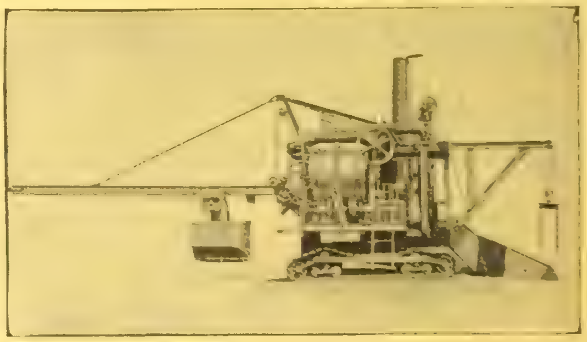
"Marion" Steam Shovels
and Ditchers





"Industrial
Works"
Cranes

"Ransome" Concrete
Mixers



Fast
Mixing
and
Discharge

Branch:
108 Mail Building,
TORONTO
Telephone Adelaide 840

F·H·Hopkins & Co.
Limited

Head Office
MONTREAL
Telephone Main 3420

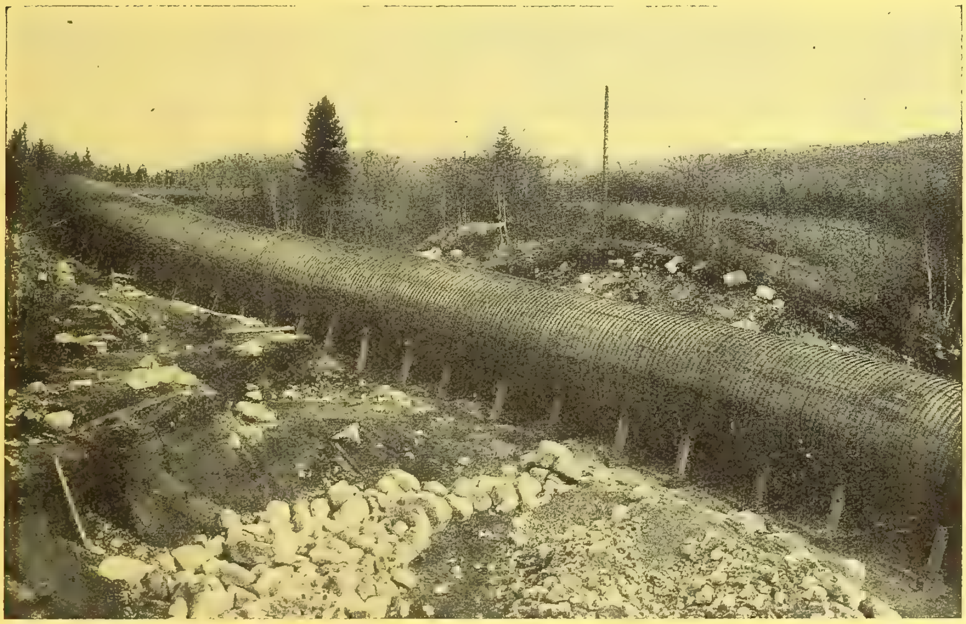
Vol. 37 Toronto, April 25, 1923 No 17

Contract Record and Engineering Review

Wood Stave Pipe

For long and Satisfactory Service

"Pacific" Wood Pipe is in use today from the Atlantic to the Pacific Coast for Hydro-Electric development and is giving every satisfaction: Our specialty, complete construction.



This 10 ft. dia. Wood Pipe has recently been completed by us for the Nova Scotia Power Commission's development at St. Margaret's Bay N. S.

Write us for information

Pacific Coast Pipe Co., Limited

1551 Granville Street - - Vancouver, B.C.

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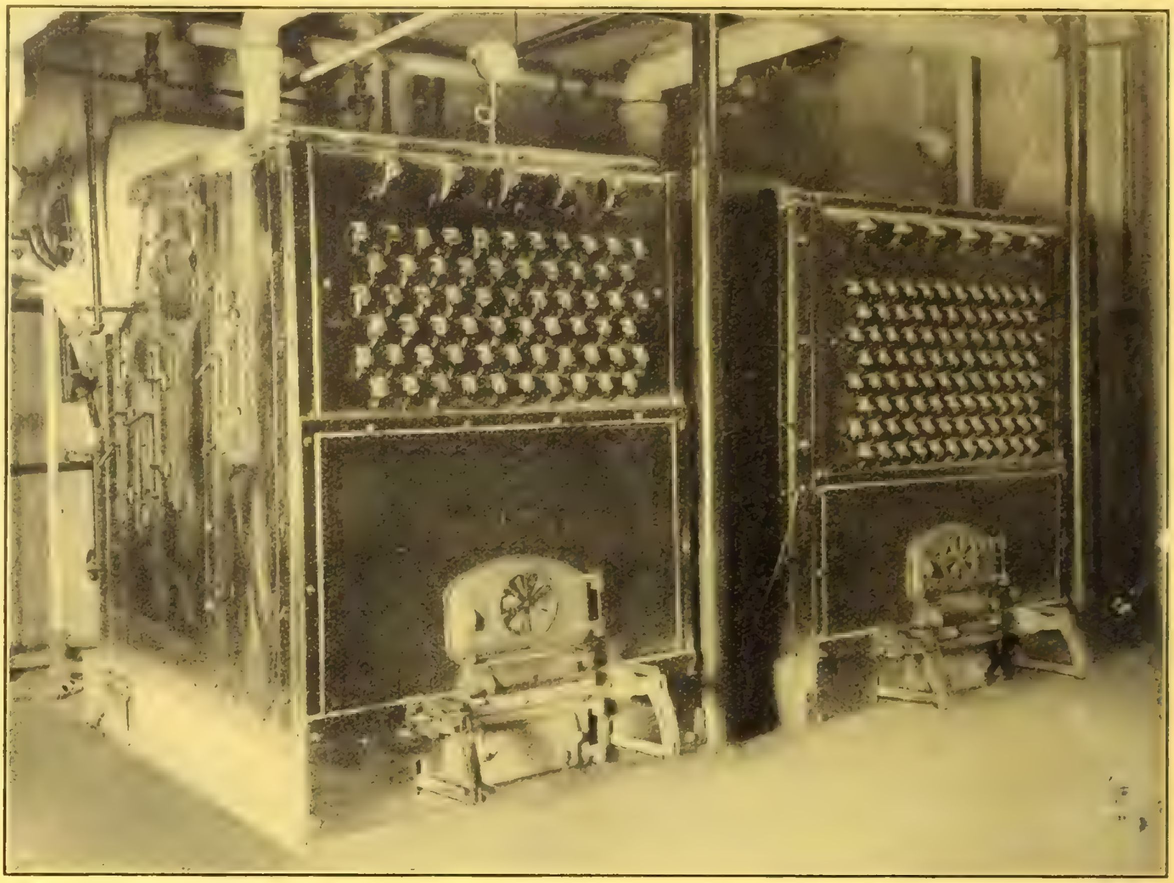

GOLDIE & McCULLOCH

TYPE "H"

Water Tube Heating Boilers

Are designed to efficiently and satisfactorily Heat all kinds of Public Buildings such as Schools, Churches, Business Blocks, etc.

Recent Installations include:—The Ottawa Collegiate; Ottawa Citizen Bldg; Rockliffe School, Ottawa; La Corona Hotel, Montreal; Kitchener-Waterloo Collegiate; County Court House, Ottawa; Guelph Collegiate; Laroeque's Store, Ottawa; McIrvine Block, Galt; Kitchener Y.M.C.A.; Galt Y.M.C.A.; G. Ruppel & Co., Kitchener; Dominion Shirt Co., Kitchener; The Hurlbut Company, Preston.

Illustration shows the Kitchener Y.M.C.A. Installation

Ask for Circular, Prices, etc.

Office of J. ALBERT EWART, B.A.Sc,
Architect,
Jackson Building,
Ottawa.
February 6th, 1923.
The Goldie & McCulloch Co. Limited,
38 Monk Street, Ottawa, Ont.

Dears Sirs:

Answering your letter of February 5th, regarding the type "H" Water Tube Heating boilers which have been recently installed at the Ottawa Collegiate Institute, I beg to state that these boilers have been in operation since the beginning of the winter and are giving entire satisfaction. I made inquiries to-day as to how they were working and Mr. Pearce reported that they were doing fine. As you are aware this was an exceptionally cold morning and it is a pleasure to know that we have a heating plant that can handle everything it is called upon to do without trouble.

This type of boiler we find to be a very fast steamer, so that the fireman can heat the building very quickly at any time when the fire happens to go down.

I should be very glad to recommend this type of boiler to any of your clients.

Yours very truly,
J A E/V M C K J. A. EWART.

NOTE:—Tuesday, Feb. 6th, 1923. The morning referred to above temperature registered 24° below zero.

The GOLDIE & McCULLOCH CO. Limited

Head Office and Works, GALT, Ontario, Canada

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SUITE 1101-2,
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WINNIPEG, MAN.

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ROSS & GREIG,
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MONTREAL, QUE.

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VANCOUVER, B.C.

"WHY"

In these days of keen competition in the building industries the contractor who purchases **LONDON EQUIPMENT** finds himself equipped to do work at the lowest cost.

"BECAUSE"

they are designed to run continually. Breakdowns and repairs put the contractor out of business.

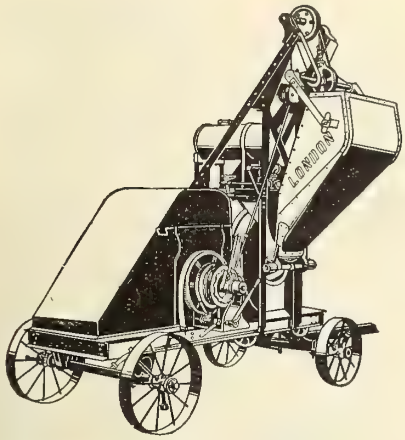

Fig. 33
London Heavy Duty Mixer with Gasoline Power

Fig. 19 illustrates the London Concrete Mixers, Nos. 4 and 6. Designed for building culverts, bridges, sidewalks, foundations, silos or any work requiring a portable mixer with a capacity up to 60 cu. yards per day. Described in Bulletin 49-C-D.

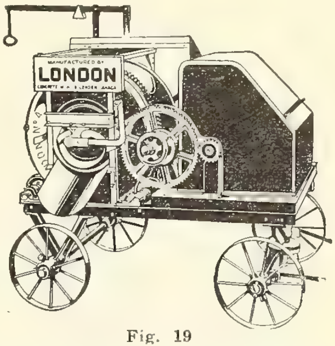

Fig. 19
London Concrete Mixers, Nos. 4 and 6

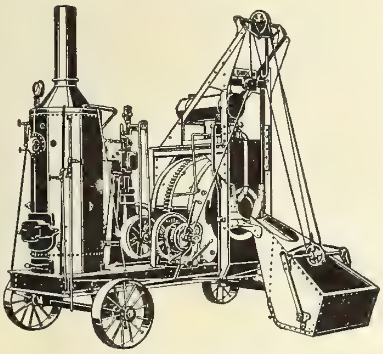

Fig. 39
London Heavy Duty Mixer with Steam Power

Figs. 33 and 39 illustrate the London Heavy Duty Concrete Mixers, built in five sizes and in capacities from 90 to 300 cu. yards per day. Described in Bulletin 49-F-1.

Fig. 814 illustrates the London Gem Concrete Mixers Made in two sizes, Nos. 3 and 5. Especially suitable for small contracts. Capacities up to 50 cu. yards per day. Described in Bulletin A-3.

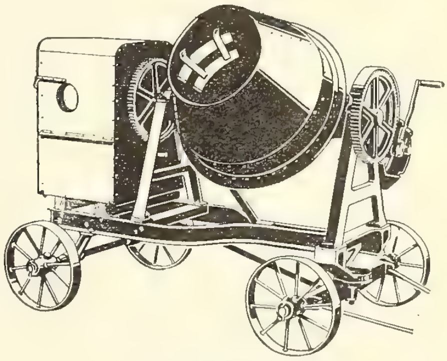

Fig 814
London Gem Concrete Mixers Nos. 3 and 5

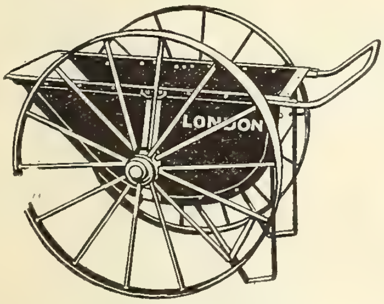

Fig. 83
London Concrete Cart No. 6

Fig. 83 illustrates the London Concrete Cart No. 6. The load is correctly balanced. No weight on the operator's arms. Dumps easy and clean. High grade construction. Described in Bulletin O.

Made in Canada

We manufacture Concrete Mixers, Hoists, Air Compressors, Pumps, Brick, Block and Tile Machines, Barrows, Carts, Silo Moulds, Ornamental Moulds and Tools.

The London Concrete Machinery Co., Limited

Dept. 7 London, Canada

World's Largest Manufacturers of Concrete Machinery

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Geo. F. Foss Machy. & Supply Co. Montreal.
Harvard Turnbull & Co., Toronto.
General Supply Co., of Canada, Ottawa and Winnipeg.

E. A. Muir, Port Arthur.
Gorman's Limited, Calgary and Edmonton.
West Kootenay Equipment & Construction Co., Nelson, B.C.
B. C. Equipment Co., Vancouver.

ANY paver costs enough, and is a big enough factor in your profit to justify most exacting care in your paver choice!

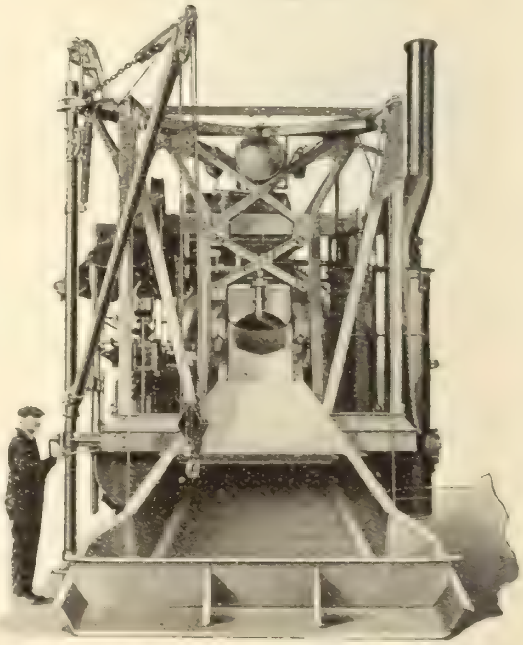
You ought to know all about the Koehring 21-E Paver—not merely the general facts, but the details of construction — because this paver is the product of mature Koehring leadership experience in the paver field, and of the outstanding, inflexible Koehring policy of "Heavy Duty" construction. Beyond question — in its liberal drum dimensions, its day-by-day, season-by-season yardage ability, its high speed operation and "Heavy Duty" construction — this paver is the standard by which to judge paver values. It is worth your while to be thoroughly informed. You do yourself a truly valuable service by writing for the Koehring Paver Bulletin P. 34

Koehring Capacities

Heavy Duty Construction Mixers: 10, 14, 21, 28 cu. ft. mixed concrete.

Pavers: 7, 10, 14, 21, 32 cu. ft. mixed concrete.

Dandie Light Mixer: 4 and 7 cu. ft. mixed concrete. May be equipped with power skip or low charging platform. Water measuring tank and light duty hoist.



Koehring Company of Canada, Limited

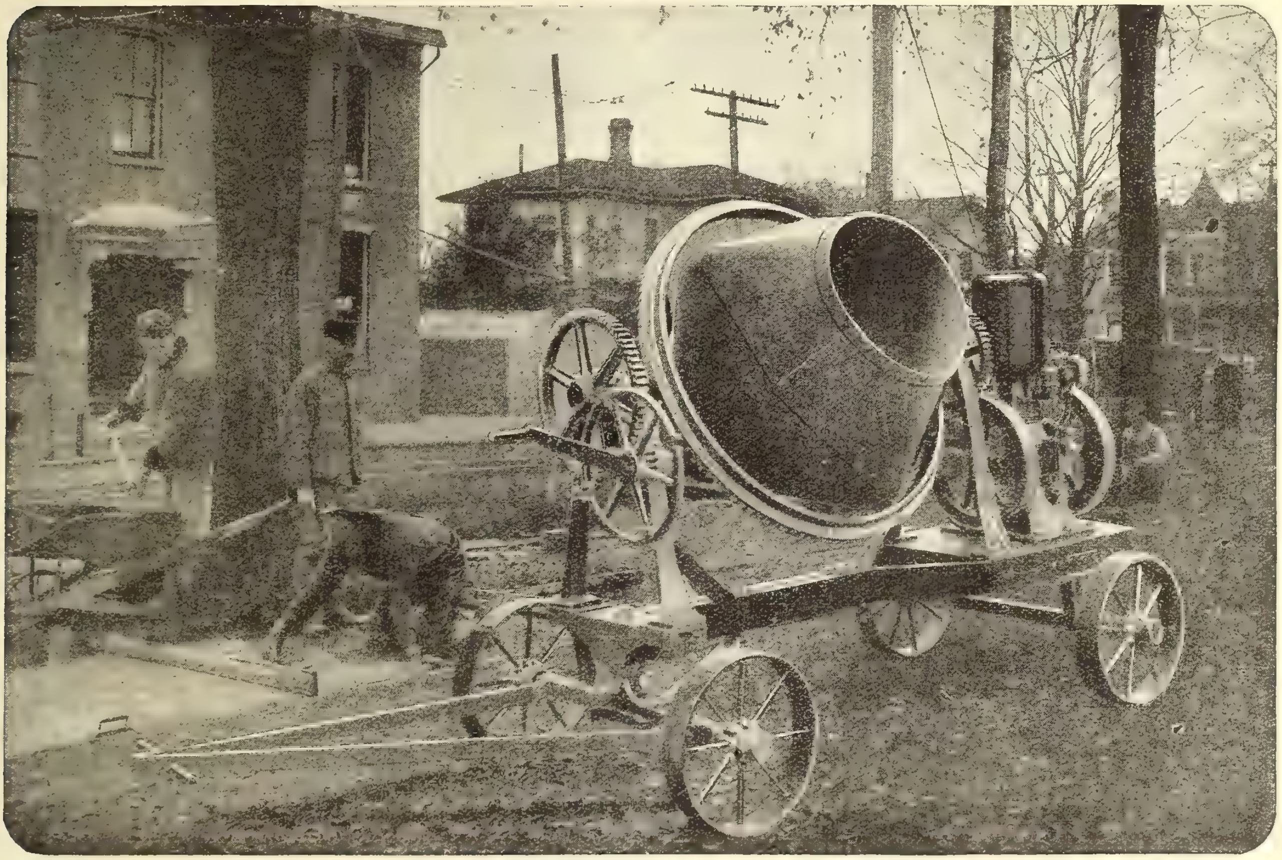
105 Front St. East,
Toronto, Ont.
Phone: Main 1498

616 Canada Cement Bldg.,
Montreal, Quebec
Phone: Uptown 3026

AUSTIN MACHINERY
"MOVES THE EARTH— MIXES THE CONCRETE"
TRADE MARK

The CUB-HEX

A LIGHT-TYPE PORTABLE CONCRETE MIXER



THE PROFITABLE MIXER FOR THE SMALL JOBS

Ordinary foundations, sidewalks, curbs, gutters, silos, tanks, culverts, floors and similar work not requiring the greater capacity of the larger size mixers can be more profitably handled by means of the "CUB HEX".

Its greater speed and the perfect mix, possible only with the famous Austin Cube principle, will save the contractor many dollars on the smaller jobs.

Its output of perfectly mixed concrete, or mortar cannot be equalled by any other type of mixer, and it has honestly earned its reputation as the GREATEST UTILITY MIXER ever produced.

Illustration shows engine exposed, standard equipment is supplied with sheet metal housing entirely enclosing same.

Write us for descriptive literature, prices, etc.

CANADIAN AUSTIN MACHINERY LIMITED

WOODSTOCK, ONT.

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Man. and Sask.: J. L. Neilson Co., Winnipeg.
Ontario: Dominion Industrial Products Co. Ltd., Toronto.
Quebec: M. W. Davidson, Montreal.
Maritime: Frank A. Gillis Co., Halifax.

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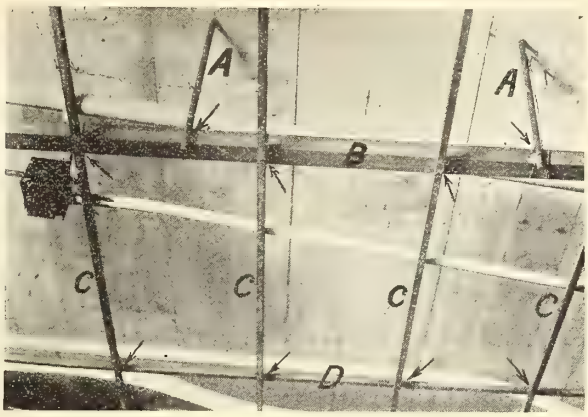

Welding ceiling construction—Arrow indicates points of welding

Electric Arc Welding

has thousands of applications from the construction of steel work carrying suspended ceilings, as shown in the cut, to the manufacture from sheet steel of a multiplicity of articles to supersede costly cast iron.

We have four machines in daily use in our shops in new construction and repairs. No preheating necessary. We repair Boilers, Steam Shovels, Hoisting Engines, Cylinders, etc., etc. Manufacturers of well known Lincoln Motors and Electric Welders.

Lincoln Electric Company of Canada, Limited
136 John St., Toronto

BATES SYSTEM
OF BAR TYING
for
Reinforced Concrete Work

Save 2/3rds the time on concrete reinforcing jobs by using Bates Bar Ties and Tying Tools.

Three turns of the Bates Tool and the Bars are tied.

Write for circular covering prices, etc.

Tying Concrete Reinforcing Bars with Bates bar ties and tying tool

Bates Bar ties were used on the largest reinforced concrete jobs in the United States and Canada.

A large stock of bar ties all sizes carried in stock for immediate shipment.

BATES VALVE BAG CO., LIMITED
Niagara Falls, Ont., Canada

ROBERT G. NOLL
Hamilton Ont., Canada

DRUMMOND & REEVES LTD.
Toronto, Ontario

MUSSENS LIMITED
Montreal, Winnipeg, Vancouver

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Sturtevant, B. F. & Co.

Fans, Silentvane
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Chew, Manley

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Laurie & Lamb

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Northern Architectural Iron

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Rawplug Co., of Canada

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McGregor & McIntyre

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National Fireproofing Co.
Vitrified Clay Pipe Publicity Bureau

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Rogers Supply Co.

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Mercer Bros.

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Canadian Ingersoll Rand Co.
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London Concrete Machry. Co.
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Canadian Mead-Morrison Co.
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Koehring Co., of Canada
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Kerr Engine Company
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McAvity & Sons, T.
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Canadian Equipment Co.
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Canadian Austin Machinery
Canadian Equipment Co.
Canadian Link-Belt Co.
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Koehring Co., of Canada
McGovern, T. J.
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Builders Iron Foundry

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Philip Gies Foundry

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Hamilton Co., Wm.
Horton Steel Works, Ltd.
MacKinnon Steel Company

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Dennis Wire & Iron Works Co.

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Canadian Pipe Co.
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Hopkins & Co., Ltd., F. H.
Mussens Limited

(Continued on page 10)

A recent photograph of the Toronto Asphalt Roofing Company's plant at Mount Dennis, Ontario.

Mr. J. W. Milne, President and founder of the Toronto Asphalt Roofing Company. After seventeen years experience as superintendent of the Brantford (Asphalt) Roofing Company he launched an enterprise of his own to manufacture a superior type of asphalt roofing by a new process of his own invention.

A New Industry With One Purpose

To Manufacture a New and Better Asphalt Roofing For Every Type of Building

In 1921 the Toronto Asphalt Roofing Company was founded at Mount Dennis, Ontario, to manufacture a superior quality asphalt roofing by an exclusive process: the "Milne" System. Today, only two years later, the activities of this industry stretch far and wide over the Dominion and its sales have grown to such an extent that three additions to the original plant were necessary.

That this industry has achieved so remarkable a success in such a short post war period is due to four facts of vital interest to every builder and contractor:

1. The need for a more durable, more uniform and more artistic roofing is becoming increasingly apparent every year.
2. Fire chiefs and insurance companies everywhere are recommending that better roofing be used as a safeguard against the dangers of roof fires (Bear in mind that Canada's fire loss is $45,000,000 annually—the largest per capita fire loss of any country in the world).
3. Asphalt, 99% pure, combined with high grade, strictly all rag felt, is proving to be the ideal basic material for modern roofing protection.
4. Under the exclusive Milne System, the Toronto Asphalt Roofing Company are producing a higher quality asphalt roofing than ever before manufactured.

When you recommend Toronto Asphalt Roofing to your clients you recommend roofing that will outlast other roofing, roofing that has proved itself by rigid tests to be fire-resisting, roofing that has distinctive beauty and charm to suit the finest home, roofing that will increase your prestige by the good service it gives.

Full particulars and prices supplied promptly.

The Toronto Asphalt Roofing Mfg. Co., Ltd.
Mount Dennis - - Ontario

THE COMPLETE QUALITY ROOFING LINE

TORONTO ASPHALT SLATES
"They will not curl."
Red or Green or Heather.

TORONTO ROLL ROOFINGS
"Better-made for best Service."

Slate Surface in Rolls
Redroc or Greenroc or Heather.

Heavy Quality.
Both sides finished with fine silica.
In various weights.

Milenite Smooth
Both sides finished smooth with fine talc.
In various weights.

Special Service
Fine silica one side, other side finished with fine talc.
In various weights.

SUPERIOR ASPHALT FELT
The "Permanent" Sheathing.
Wind and weather proof. Does not deteriorate with age.
In various weights.

"BUILT-UP" ROOF
For Flat Roof Buildings.

NORTHSIDE SHEATHING
For wind proofing the house.
Excellent insulator and sound deadener.

Write us for Samples and Prices

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ASPHALT
ROOFING

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Vancouver Wood Pipe and Tank Company
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Road Building Transportation Without Investment

THE GENERAL CONTRACTOR or road builder can now obtain reliable, efficient, highgrade truck transportation without investment and at prices often much lower than if he owned the trucks himself.

The owners of over 100 Packard Motor Trucks have asked us to act as a clearing house for them. Having years of practical experience in solving transportation problems, we are able to assist both contractor and owner in getting together on the best possible basis.

The contractor gets just the service he wants, when he wants it, as long as he wants it. The owner gets a fair price for honest work well done.

Packard Truck owners are solid, responsible business men who are zealous to build and maintain a reputation for superior service. Firms like Marsh & Morrison, Rilett Bros., Angstrom & Verochio, Storer & Donovan, Carruthers & Cassidy, Norman McNaughton, and dozens of others have established an enviable reputation in the truck transportation field. In addition to trucks, they own a large quantity of supplementary equipment such as loaders, steam shovels, clams, etc.

Whether your job is large or small you will find us and Packard Truck owners anxious to serve you promptly, efficiently, and at reasonable prices. It will pay you to consult us about your transportation problems.

PACKARD

PACKARD ONTARIO MOTOR COMPANY, LIMITED
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Toronto

Architects
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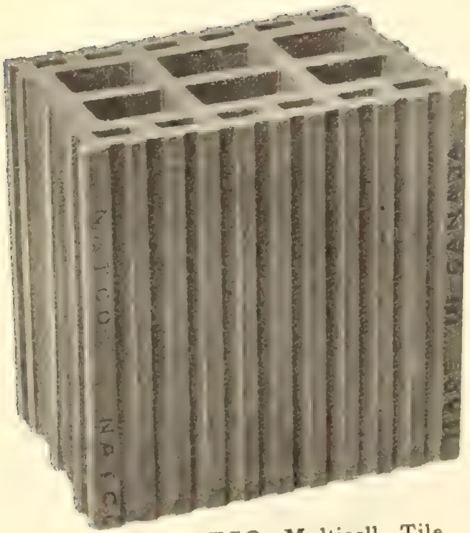
Beauty—More Than Skin Deep

THE charm of this attractive home is not entirely visible to the eye. Its fire-proof and sturdy walls of NATCO Hollow Tile with their continuous air cells insulate the interior against the heat of summer and the cold of winter. The elimination of through mortar joints (an exclusive feature of all NATCO Hollow Tile) assures that it will remain perfectly dry within, despite frost, thaw or rain.

The beauty of NATCO Homes is **wall deep.** They are as permanent as those constructed of solid masonry because the hard clay of the tile offers more resistance to decay than does stone. Moreover, NATCO Hollow Tile, having every advantage of solid masonty construction. is far more economical. The cost of a NATCO Home is little more than one of frame.

NATCO Hollow Tile is always a profitable investment. It assures satisfaction to the home builder and, therefore, prestige, good will and profit to architect and contractor.



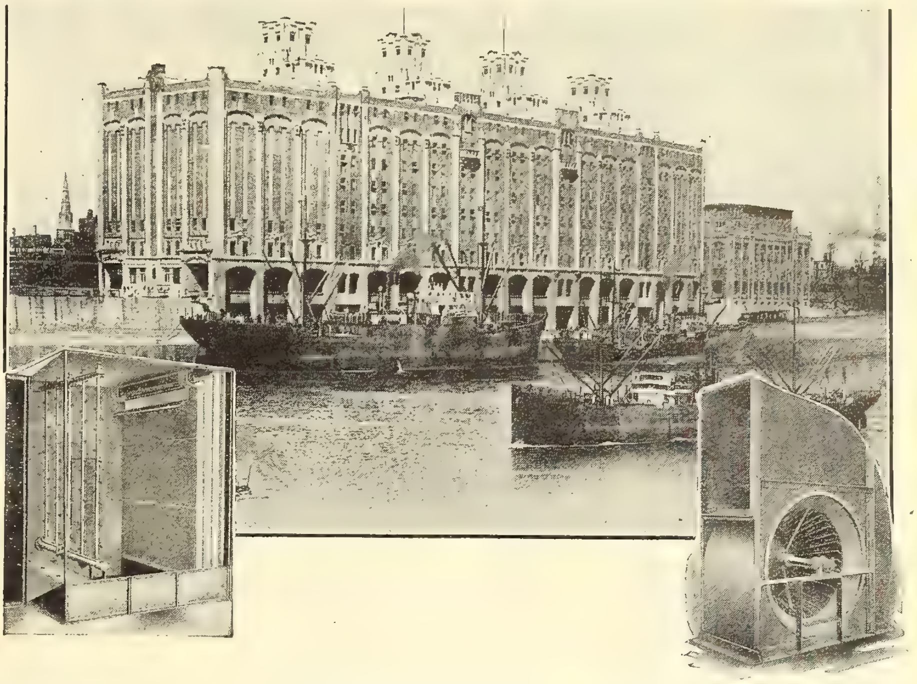
New 8" NATCO Multicell Tile Unit showing dovetail method for gripping stucco on exterior and plaster on interior.

NATIONAL FIRE PROOFING COMPANY
OF CANADA, LIMITED

Factory: Hamilton
Dominion Bank Building, TORONTO

NATCO HOLLOW TILE

Largest Cold Storage Warehouse in America has Air and Brine Circulated by Our Fans, Pumps and Carrier Air Washers



Fumes from material that previously occupied storage space are kept from contaminating next material stowed. Send for catalog covering equipment. Write to Department No. 12.

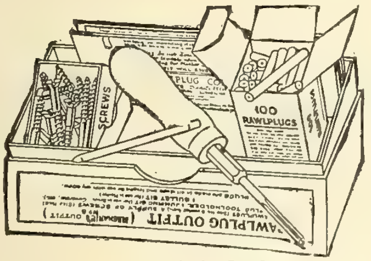
Canadian Blower & Forge Company, Ltd. **Kitchener, Ont.**

Toronto Montreal Calgary Vancouver St. John Winnipeg

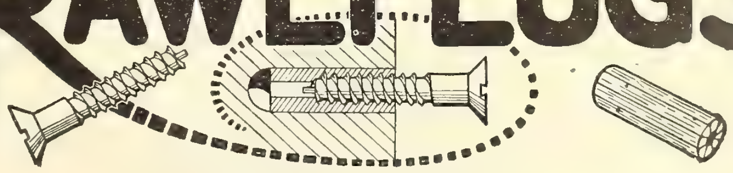
Fix Firmer and Cut Costs

Save time and labor by fixing it with Rawlplugs. Wherever screws are used, they will be held longer and stronger by using Rawlplugs. They hold in ANY material and make neat work easy. Rawlplugs are the most economical and efficient device on the market. They do away with a bag-full of tools. Try them on your next job.

FIX IT WITH RAWLPLUGS



Mechanics' Outfit



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Place a trial order today. One test will show you why builders throughout Canada are using them.

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THE BULL-DOG FLOOR CLIP

Modern Money Saving Simple Device for Laying Wood Floors over Concrete

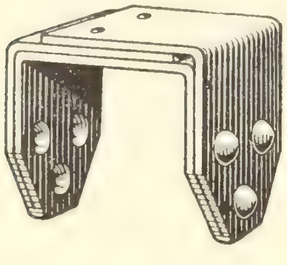
ON U. S. MARKET ONE YEAR—
OVER TEN MILLION SOLD

Put the BULL-DOG
on *your* Pay-roll

Saves Material—Saves Labor—Saves Money

Put the BULL-DOG
on *your* Pay-roll

ARCHITECTS & CONTRACTORS who have used BULL DOG FLOOR CLIPS say the BULL DOG METHOD is the best ever devised to hold a wood floor to concrete.



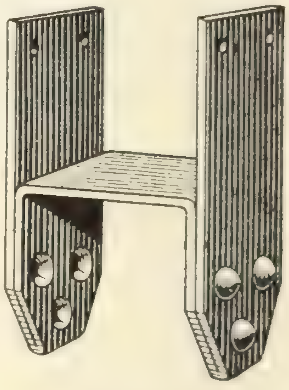
Canadian Pat. No. 216554
March 7, 1922

Bull Dog Floor Clip as manufactured and placed in soft concrete, which allows free use of floor.

NO CONCRETE FILL REQUIRED: USE 2 x 2 unbevelled instead of 2 x 3 bevelled sleepers.

ACTUAL MONEY SAVED by eliminating a concrete fill and by using 2 x 2 unbevelled sleepers amounts to over 4c. a square foot of floor area; and over 3c. against a cinder concrete fill.

REDUCE DEAD LOAD:—Approximately 18,000 lbs. per 1,000 square feet by eliminating concrete fill; Great Saving in re-inforcing steel is effected.



Canadian Pat. No. 216554
March 7, 1922

Bull Dog Floor Clip showing top members raised to receive floor strips.

SPEED UP BUILDING:—Unobstructed use of floor slab until you are ready to lay wood floor. Sleepers and finished floor can be laid at one time, thereby preventing costly delays waiting for fill material to dry out.

THE BULL DOG FLOOR CLIP is made of 20 Gauge KEYSTONE GALVANIZED COPPER-STEEL. They hold the sleepers so rigidly to the floor slab that buckling or squeaking of finished floor is impossible; neither will the finished floor dome up from moisture, which is often the case when a concrete fill is used.

ARCHITECTS:—By adopting The Bull Dog Method you eliminate all possibilities of hit or miss construction.

DRY ROT, which usually attacks a poor grade concrete or cinder-concrete fill and is in turn transmitted to the sleepers and finished floor, naturally will not take place; a slight circulation of air under the finished floor keeps it and the sleepers in perfect condition.

CONDUITS AND PIPES can be placed on top of the slab, right under the finished floor; are easy to get at; and are practically free from corrosion, whereas concrete fill corrodes them very quickly.

THE WESTERN STEEL PRODUCTS LTD., Winnipeg, Man.

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Fill in this Coupon, Mr. Contractor—

Cut this out--fill in--and mail to us today--no obligation to you whatever

Date ......

Place ....

To: Engineering & Machine Works of Canada, Limited,
St. Catharines, Ont.

Dear Sirs:-

I am a Contractor and I want to bid on work as per the following brief description:

....

(state whether it is ditching, foundation digging or road grading, give the approximate yardage to

....

be removed, and, if possible, a general idea of the nature of the soil).

....

I want you to tell me frankly just what the Keystone Excavator can likely do for me, what equipment I will need, what it will cost me to buy and what will my daily working costs be?

....

Name ....

Put your Problem up to us.

KEYSTONE EXCAVATOR

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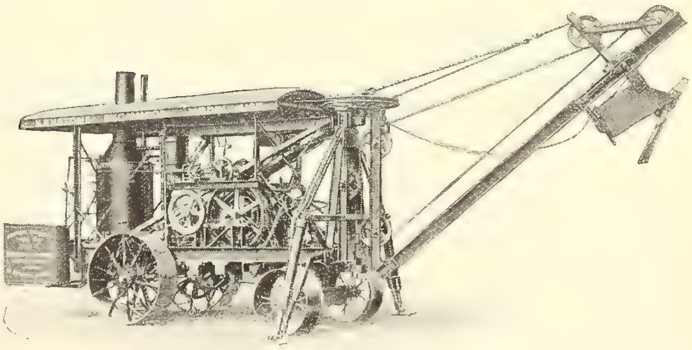

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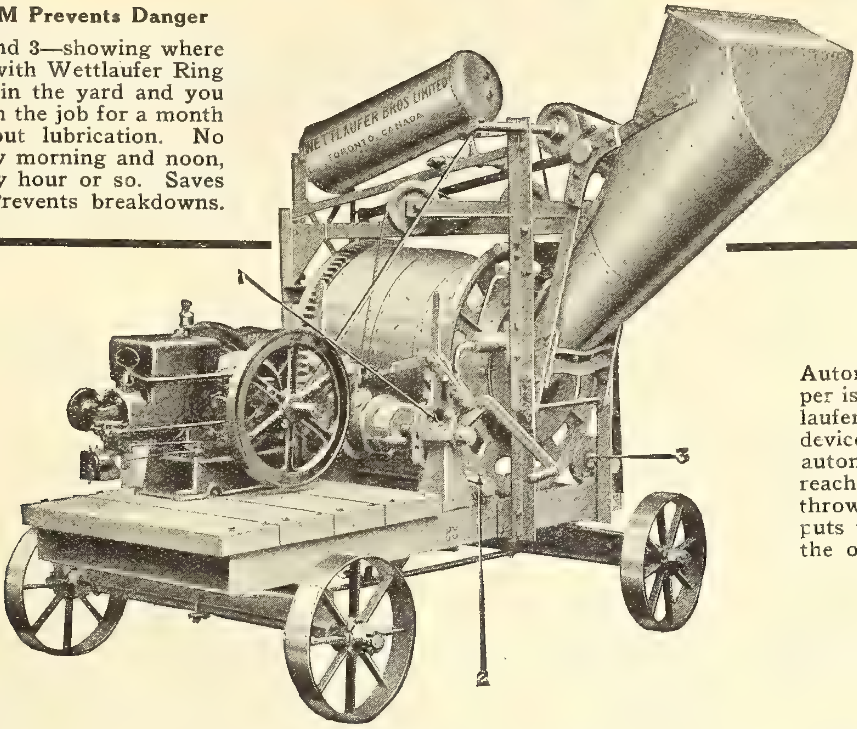
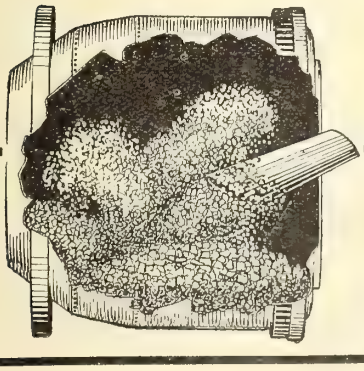


Automatic Loading Hopper is equipped with Wettlaufer patented safety device. Hopper stops automatically when it reaches the proper pitch—throws the clutch out and puts the brake on. Keeps the operator's mind free.

Big Reduction in Price Makes this 6 Cub. ft. Wettlaufer Mixer *Sensational Value.* Write for Facts

Equipped with the Wettlaufer Heart-Shaped Drum

This No. 1 B Stationary Drum Mixer has the famous Heart-Shaped Drum—an exclusive Wettlaufer feature. Gives better mix—more perfect concrete. Mixes faster than any other drum designed. Discharges faster than any other make of machine. Lasts longer—uses less power—requires less speed. Get the full details from our folder 102. Write now.



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Simple in design—light yet strong. Equipped with Stationary Batch Bin or Automatic Loading Hopper. Hoisting attachment if desired. Get the facts. Send now for folder 102.

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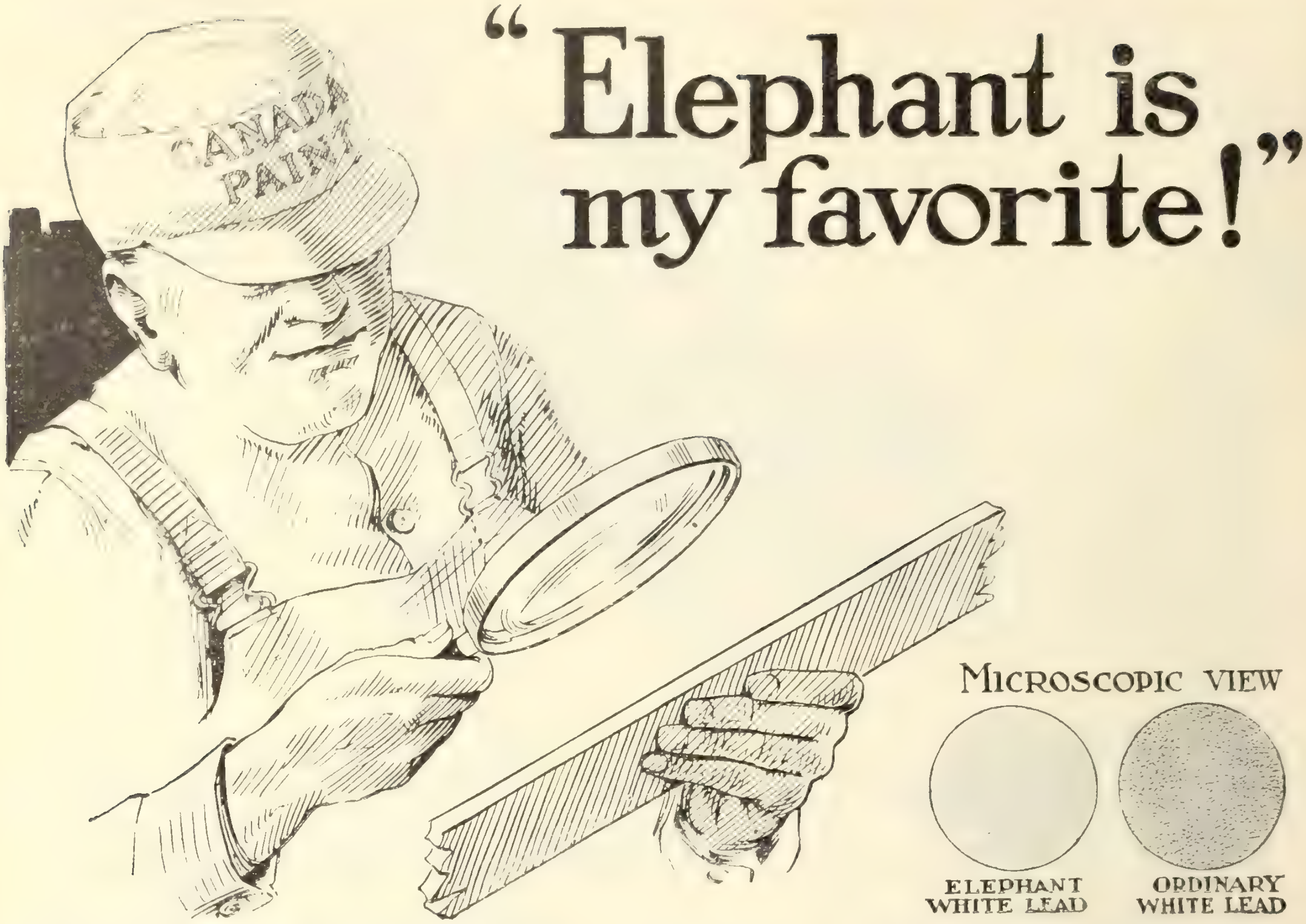

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"Save the surface and
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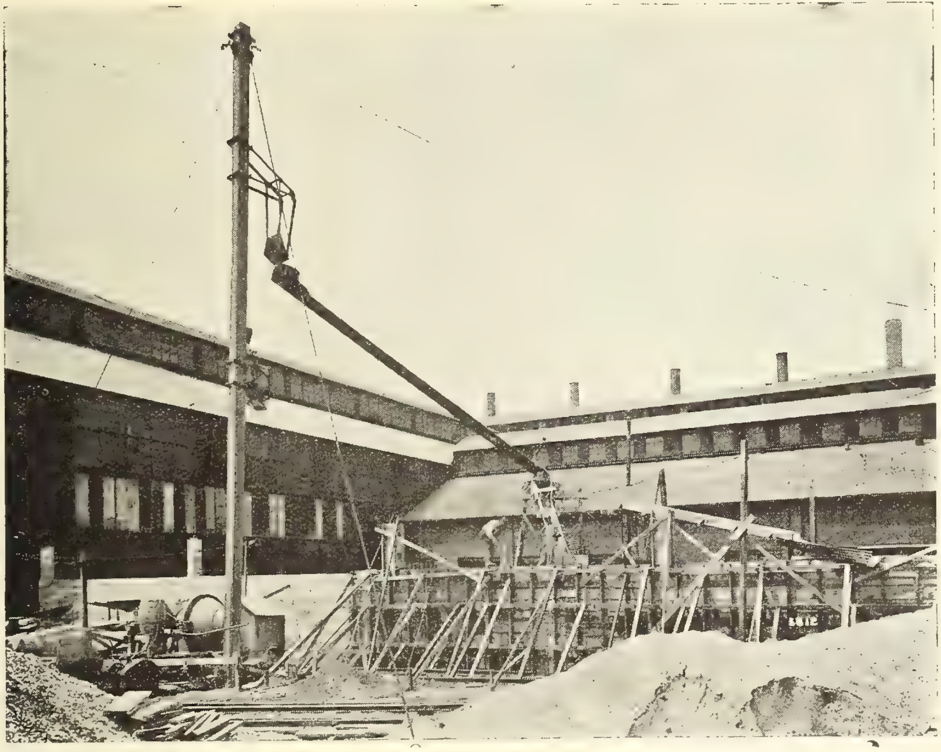
Where the Space is Limited or the Quantity is Small You Should have an



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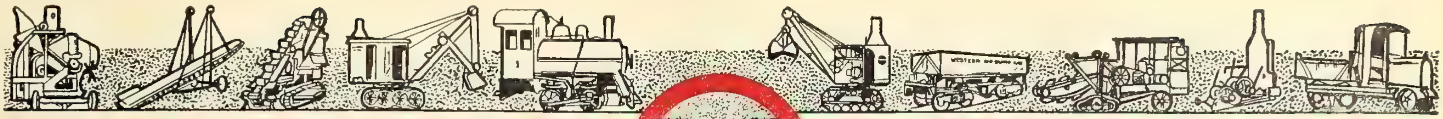

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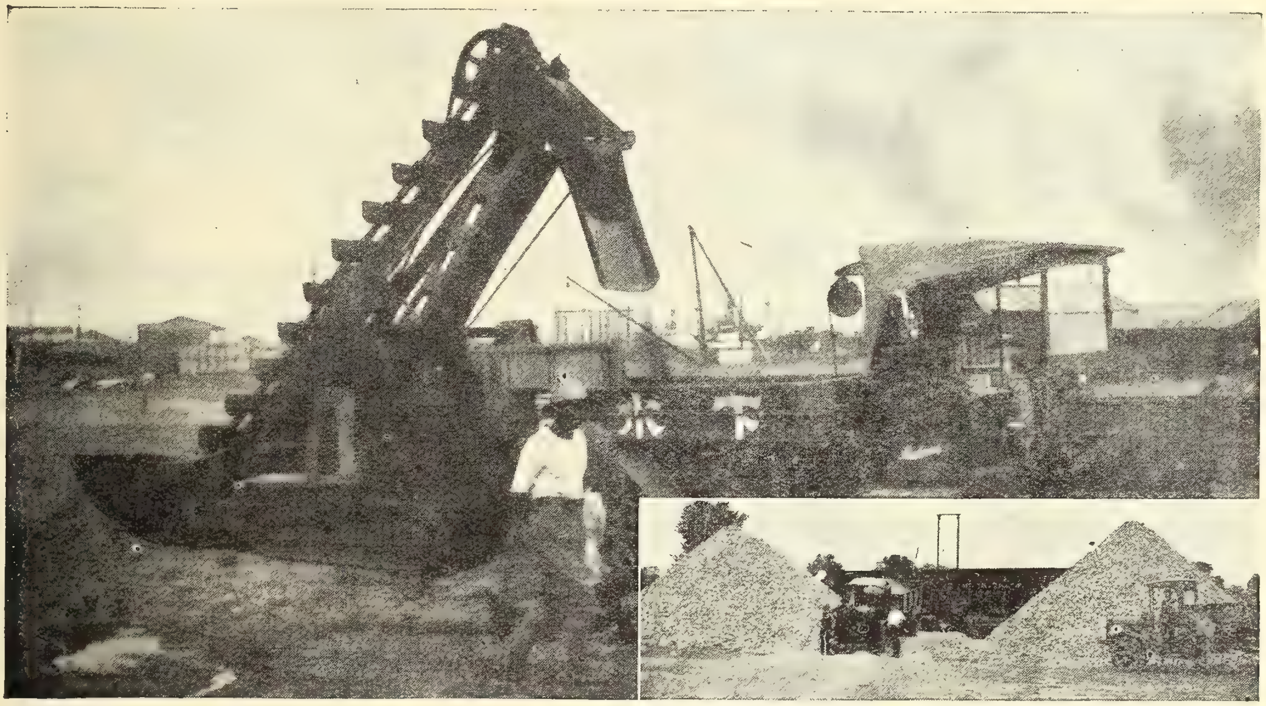
BARBER B G GREENE

Portable Belt Conveyors Self Feeding Bucket Loaders



Even in Tokyo, Japan, where shovel labor is cheap, a Barber-Greene Bucket Loader saves money by replacing shovel men

Shovel Labor is Getting Scarce and Going Up

Because of the restrictions on immigration from Europe, unskilled labor is scarce and wage increases for it are becoming common. With the present speeding up of industrial activity, it is likely that these wage increases will be general by summer—and that men will be hard to keep and get.

The natural result of this condition is that contractors are even more interested than they were last year in mechanical shovelers such as the Barber-Greene Loaders, and in Barber-Greene Conveyors.

Last year many were used mainly to increase their profits and speed up the job.

This year they are regarding them as an absolute necessity for getting their jobs done at all.

Contractors who had only one Barber-Greene Loader last year are adding two more this year. The R. F. Conway Co., which already has four, has just bought six more. Others who had none are buying two to begin with.

On over 200 road jobs last year, Barber-Greenes saved time, labor and money in replacing men, bins, and tunnels for loading materials into wheelbarrows, horse-carts, tructractors, Fords, large trucks and Industrial cars.

Many of these contractors explain the Barber-Greene's decided superiority in saving labor, time, trouble and money by pointing to the steel-disc self-feeder.

This has a digging width of six feet four inches and consists of two flat, horizontal, 36-inch steel discs which rotate toward the centre, feeding and filling the buckets—and can be adjusted accurately by the operator to suit the needs of the job.

The buckets themselves do no digging at all so that they and their carrying chains have only the relatively easy task of carrying the material.

In addition to the disc feed there are many other advantages which explain the contractors' preference for the Barber-Greene in combatting the scarcity and cost of shovel labor.

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Superior Tracing Papers

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Fast, sharp prints by any process.

A heavy, strong, and exceptionally transparent paper

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Does not deteriorate with age and will not become brittle. Supplied in rolls on large diameter cores, so that it will lie flat on the board. Sheets cut to order.

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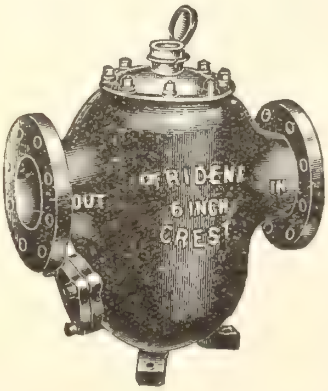

Accuracy and low maintenance cost—these are the two factors that boost the revenue of the water works. If you want to see them working at the highest efficiency, meter your system with Tridents.

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Have You Changed

your fire protection system to conform to Ontario Provincial Board of Health New Regulations?

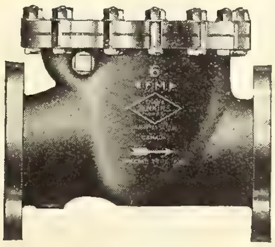

Fig. 481

Here we show you an
Iron Body "Special" Type
Jenkins
F. M. Swing Check Valve

and below a diagram showing correct method of installation.
These valves are approved by the Ontario Provincial Board of Health and are used for connections between a fire protection system having an auxiliary supply that is pumped and a municipal water supply.
Valves are designed to resist corrosion and disarrangement of parts and two of them being connected in series prove most efficient in operation.
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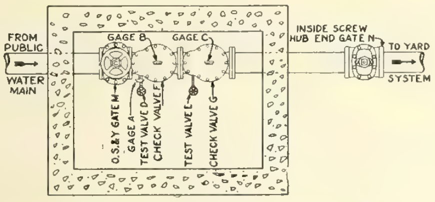

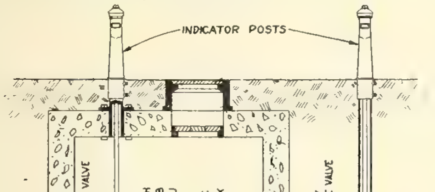

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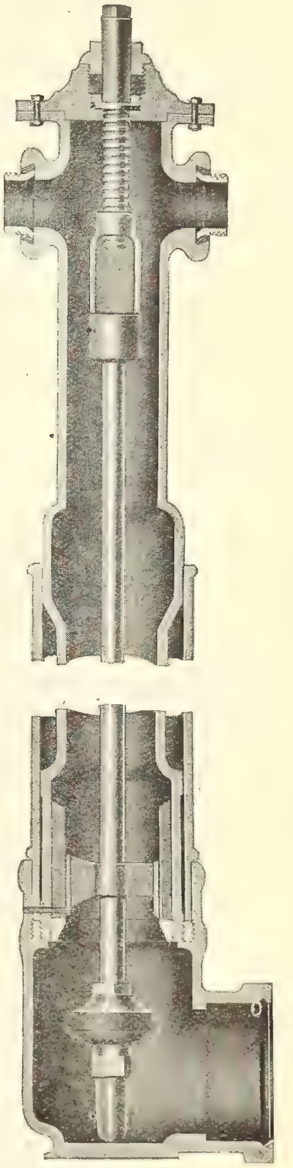
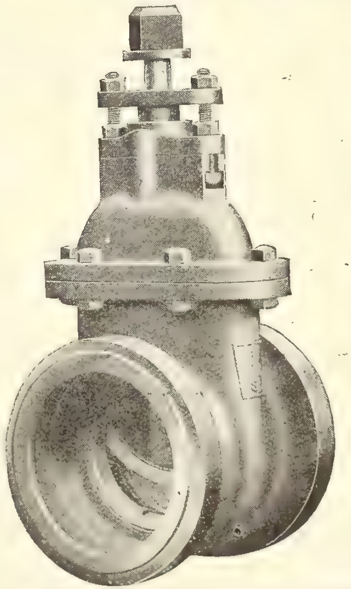
Strong, Substantial and
Modern Designs.
Prices right.
Write for prices and see.





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That is Clean, Tough Stone of a Quality suitable for Macadam Road and Concrete. We can supply you in any size or quantity. Our Service is unexcelled and our prices right.

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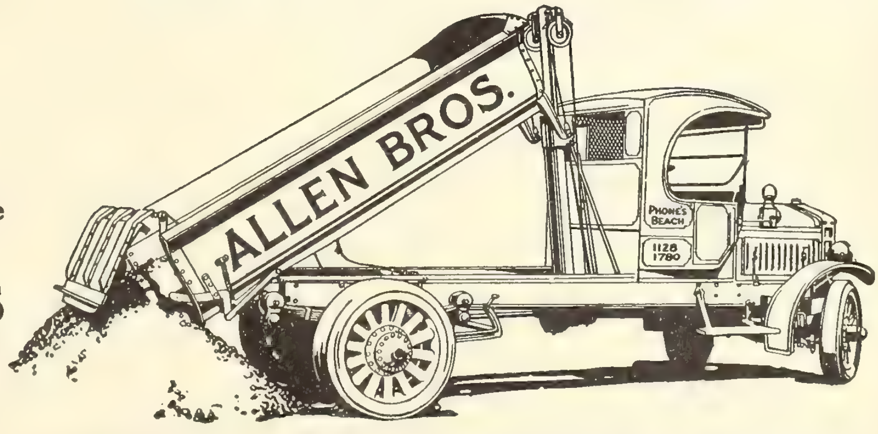

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No job too big, or too small for us.
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of the Contract Record

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for all types of buildings
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MASTIC ASPHALT FLOORS
For all classes
Heavy and Continuous Service
Machine Shops, Warehouses, Bridges, Breweries, Railroad Stations, Schools, etc. Our special waterproofing specifications have been used for years by Architects and Engineers.
All information supplied on application.
H. H. SYMMES & CO., LTD.
24 Board of Trade Bldg.
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CANADIAN RED QUARRIES
and tiles for walls, entrances and hearths.
Briquettes, Metal Lath, Dome Dampers, Coal Chutes
Sani-Onyx Restaurant Equipment
GENERAL PRODUCTS, Limited
Contractors—Agents—Jobbers
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Detroit River Construction Company, Limited
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FOUNDATIONS, DOCK WORK
PILE DRIVING, SEWERS
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Means Good Health
For the best employ
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34 PRICE ST. - TORONTO
NORTH 383
Marble Dust Marble Chips

The Smith Marble & Construction Co., Limited
Marbles, Slates, Terrazzo, Tiles, Mosaics, Ceramics, Onyx, Decorative Marble Works, Marble Memorial Tablets, Altars, Fonts and Mantels a Specialty.
145 Van Horne Ave. Montreal, Can.
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Field and Drain Tile
Famous Denison load bearing everlasting Tile at money saving prices any season of the year.
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Phones: M 2310—M 5741

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CUT STONE
Quick Shipments
1148 McDougall Windsor, Ont.

DOORS
Large assortment of stock sizes on hand
Send for catalogue
Pannill Door Co.
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131 Front St. E. - Toronto
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Contractors for
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Large Variety of Stock Patterns on hand. Special Models made to Detail.
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For Reliable Representative
Canadian Contractors
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Masonry & Steel Proofed against Water, Oils and Acids under GUARANTEE
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Phone Adel. 6310
WESTERN WATERPROOFING COMPANY EXPERTS SERVICE
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Cleveland
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OSGOOD
Heavy Duty Steam Shovels

Have you seen one of them at work? A regular giant for digging. Easy to operate—low operating and maintenance cost—and fast. Will go most anywhere. Has interchangeable trucks and can be converted, easily and quickly, to Clamshell or dragline.

¾ and 1 yard capacity.
Ask for Bulletin.

The OSGOOD Company
Marion, Ohio, U.S.A.
Represented by
POWELL EQUIP. CO., 403 McArthur Bldg, Winnipeg

Water Supply from Deep Wells

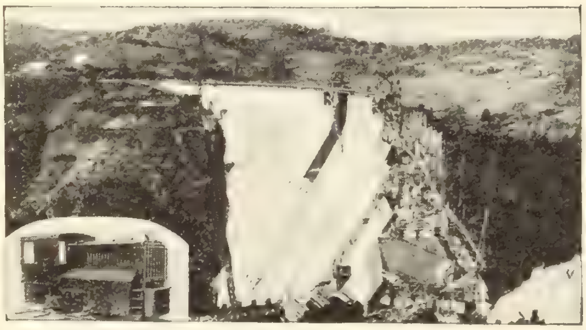
is obtained at a minimum cost by use of our deep well pumps.

Write for Bulletin 26 explaining the use of Cook's Patent Brass Tube Well Strainer.

A. D. COOK
Lawrenceburg, Indiana, U. S. A.

Manufacturer of a Complete line of **DEEP WELL SUPPLIES**, including Steam, Belt and Motor Driven **DEEP WELL PUMPS**, Wind-mill and Hand Pumps, Working Barrels and Valves, Pump Rods and Pump Rod Joints, Drill Rods and Drill Rod Joints, Drilling and Well Tools.

Catalogue Mailed Upon Request



Plymouth Locomotives Share Big in Building World's Highest Dam

PLYMOUTH Locomotives shared conspicuously in the construction of the Don Pedro Dam, located in California, the highest dam in the world, being 279 feet from the river bed it retards. The reservoir, when full, will cover an area of 3,086 acres, and will have a capacity of 270,000 acre-feet.

A track was laid on top of the dam and all materials hauled by PLYMOUTH Locomotives.

Chief Engineer Meikle writes: "We purchased six Plymouth Gasoline Locomotives from you for the Don Pedro Dam. These locomotives hauled all materials from the mixer to the dam without any delay in operation and they were one of the smoothest pieces of equipment on the job."

Write for Catalogs and Performance Bulletins.

The Fate-Root-Heath Co., Plymouth, Ohio

PLYMOUTH
Gasoline Locomotives

FOR SALE

1—Model 76 Marion Steam Shovel.

2—Model 60 Marion Steam Shovels.

1—Model 31 Marion Steam Shovel fully revolving on railroad trucks.

2—Standard Gauge 25 ton Saddle Tank Locomotives.

24—6 yard K. & J. Cars.

Eastern Equipment Co.
Limited

MONTREAL, QUE. DORVAL, QUE.
P. O. Box 792

MUSSENS LIMITED

AN AUTO-CRANE ON YOUR JOB IS A HANDY PIECE OF EQUIPMENT

For Clam Shell or as an ordinary derrick, for excavating, loading or unloading cars of material

BYERS CRANES

Half-Circle or Full Revolve on Car Wheels, Road Wheels or Caterpillar Traction

Steam, Gas or Electric Power

½yd-¾yd-1yd

Send for particulars

We have a Complete Line of Road and Excavating Machinery
SMITH MIXERS · MARSH HOISTS · INSLEY CHUTING
Barber-Greene Bucket Loaders and Portable Belt Conveyors

MUSSENS LIMITED
Montreal Toronto Winnipeg Vancouver

MUSSENS LIMITED

"It has proven to be the best Machine that I have had on my work"

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MUSSENS LIMITED

Western Dump Cars in Road Work

Heavy Road Grading in Minnesota

Western
That's Why

MUSSENS LIMITED
Montreal Toronto Winnipeg Vancouver

What Do Mussens Limited Think of Contract Record?

Well we haven't asked them, and they haven't said in so many words.

But this is what they have **done.** They have recently signed a contract for three pages in color in every issue of this paper for a year.

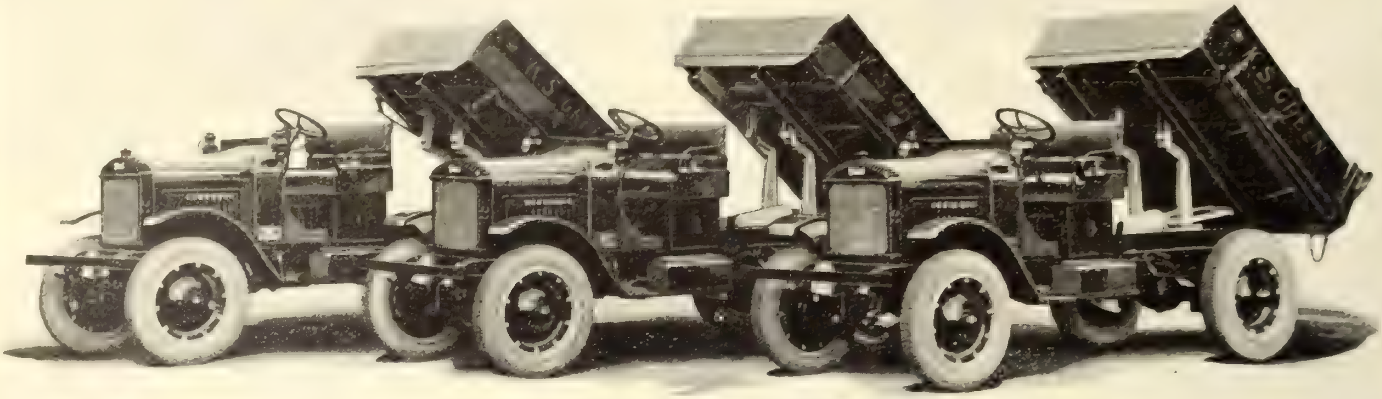
That, perhaps, more eloquently than any testimonial they could write, expresses their opinion of the value of advertising in Canada's leading publication in the construction and engineering fields.

If Mussens were a young firm or a new advertiser this decision of theirs might not have so much significance. The fact is, however, that for many years a full page advertisement for this firm has been appearing in every issue of "CONTRACT RECORD", and this increase of 300 per cent in the volume of their advertising in this one paper has been made after the most exacting test of the value of the publication.

Experience has evidently taught them that the buyers of heavy equipment in Canada read and are influenced by the advertisements which appear in "CONTRACT RECORD".

We believe it is also evidence of another important fact. It indicates Mussens' conviction that the year 1923 gives promise of increased activity in construction projects. They evidently believe that this is going to be a "buying" year.

If this is true, will it not pay other distributors and other manufacturers to use impressive space in the advertising pages of "CONTRACT RECORD"?



3 of a Fleet of 6 Stewarts in Road Building Work

Stewart 2½-3 Ton Truck Designed for Contractors and Road Builders

This chassis for road builders and contractors has a wheelbase of 124″, with a remarkably short turning radius. Either pneumatic or solid tire equipment.

The body of two yard capacity is comparatively low to the ground, with approximately 40% of the total load carried on the front wheels. The standard rear discharge type of body is fitted with an underbody Hydraulic hoist, having a centre swinging partition control for the driver. The body is 78″ long and 67″ wide, including the flares. Control lever on dial is attached to heel board underneath driver's seat. The pump is supported on special bracket, bolted to both sides. It is impossible for the hoist to crawl on chassis, there being a tie rod anchor to the body hinge.

Stewarts are Built in 5 sizes 1 to 4 Ton—A Body for every Business

Stewart

MOTOR TRUCKS

Distributed by

COMMERCIAL CARS OF CANADA LIMITED
115 Dupont St., TORONTO

Cor. Princess and James St.
WINNIPEG, Man.

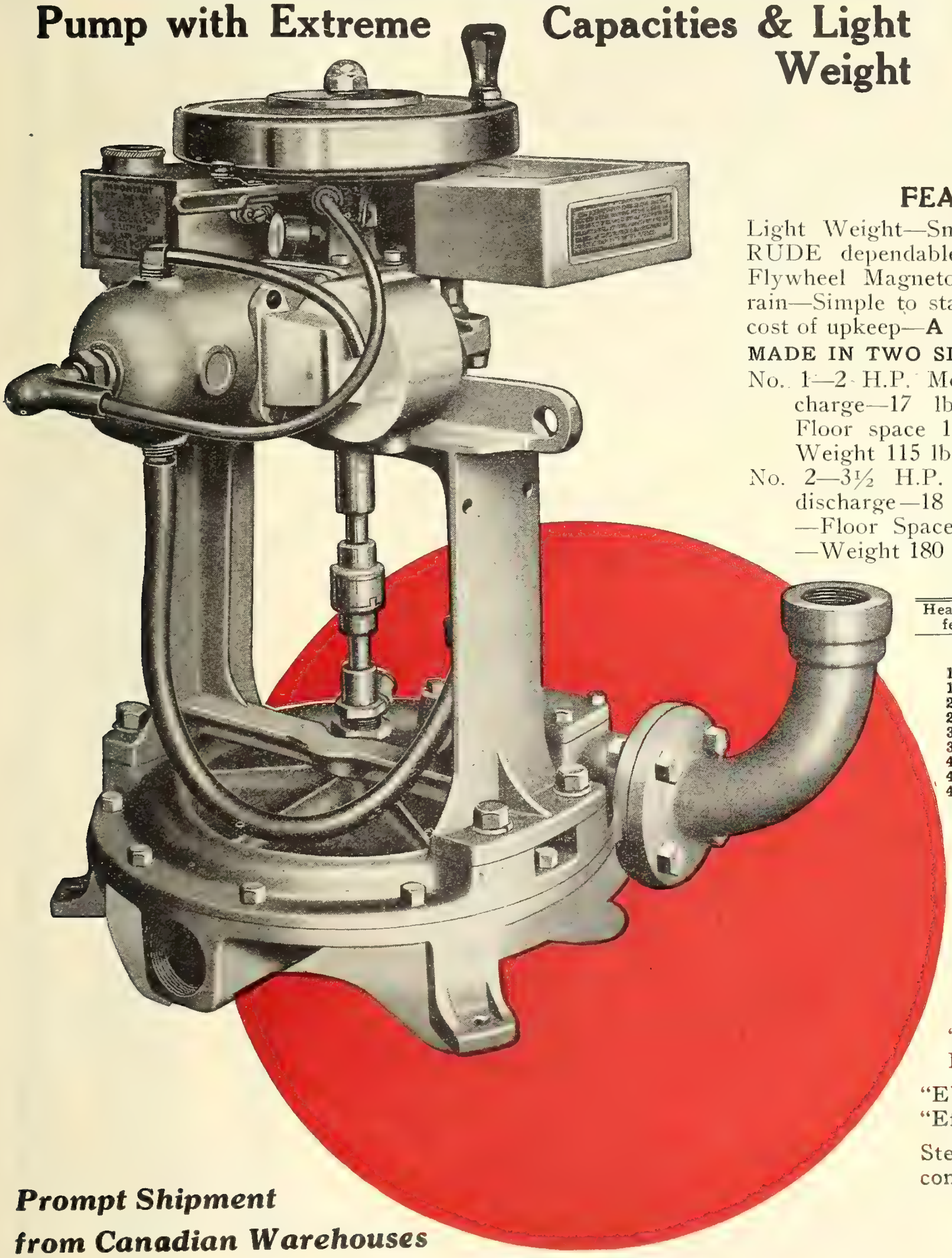
AUTO GARAGE HAMILTON LIMITED,
69-71 Hughson St. South,
HAMILTON, Ont.

The Evinrude Centrifugal Pump

6000 to 9000 Gallons per hour

A most efficient low priced and Serviceable Pump with Extreme Capacities & Light Weight

Used by Corporations, Engineers, Municipalities and Contractors everywhere.



FEATURES—

Light Weight—Small Size—Famous EVINRUDE dependable motor and Built-in-the-Flywheel Magneto—Impervious to wet and rain—Simple to start—Easy to operate—Low cost of upkeep—**A proven Unit—**

MADE IN TWO SIZES—

No. 1—2 H.P. Motor—2″ Suction 1½″ discharge—17 lbs. pressure per sq. inch—Floor space 16½″ x 23″—Height 24″—Weight 115 lbs.

No. 2—3½ H.P. Motor—2″ Suction—1½″ discharge—18 lbs. pressure per sq. inch—Floor Space 23″ x 23″—Height 32⅝″—Weight 180 lbs.

Table of Pump Capacities

Head in feet	Gal. per hour	
	No. 1 Pump	No. 1½ Pump
0	6800	9000
5	6575	8775
10	6150	8400
15	5650	7975
20	5000	7400
25	4175	6675
30	3275	5875
35	1200	4850
40	0	3350
45	0	1450
48	0	0

Watson Jack & Co., also distribute—

"BULLFROG" Concrete Carts, Scrapers, and Wheelbarrows.

"RUSSELL" Graders, Scarifiers and Conveyors.

"BOSS' Concrete Mixers, Pavers and Gasoline Hoists.

"EWELCO" Bar Cutters and "Efficiency" Bar Benders.

Steel forms for road and street construction.

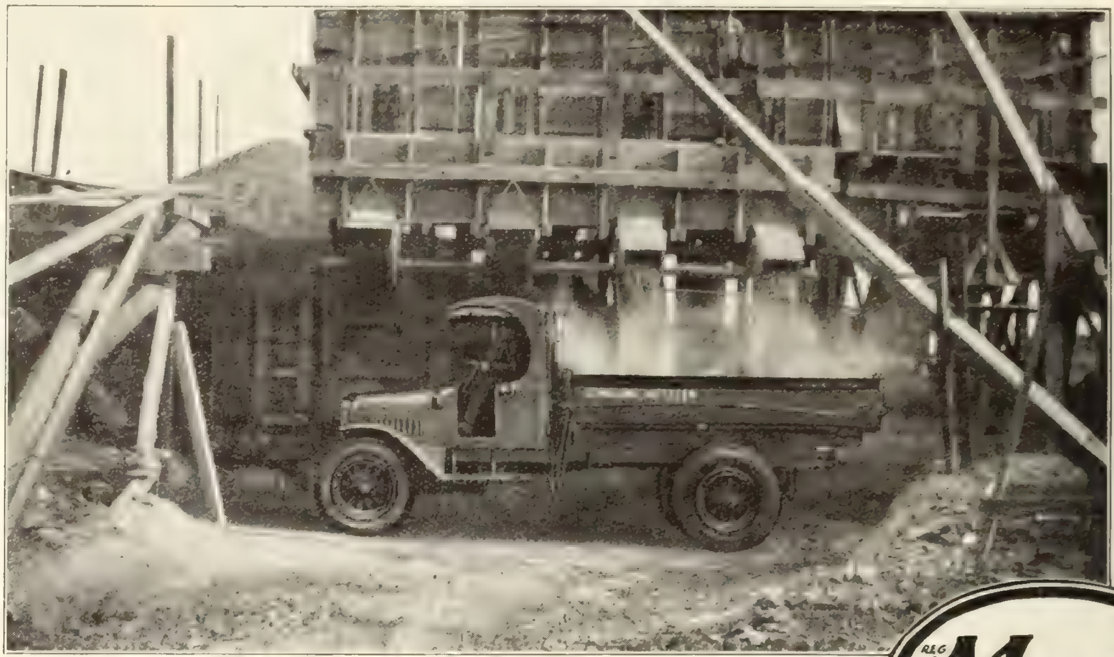
Write for Catalogue.

Prompt Shipment from Canadian Warehouses

WATSON JACK & CO. LTD.

720 Power Building **MONTREAL**

British Columbia Representative: E. G. BLACKWELL, 615 Hastings St. Vancouver, B. C.



REG. U.S. **Mack** PAT. OFF. TRUCKS

Wherever there's contracting there should be a *Mack*

WHY? Because excavating and the hauling of materials form a considerable item in the cost of any construction job. And Mack trucks are noted for their ability to keep this cost item down to rock bottom.

Continuous capacity operation, long life, a large reserve of power, unusual safety factors and exclusive features that keep operating costs low—are some of the reasons why the Mack is so highly regarded in the contracting field both in Canada and in the United States.

Do not fail to investigate the AB-Burke Special. It is in our showroom awaiting your inspection.

MACK TRUCKS OF CANADA, LTD.
28-30 Vanauley Street, Toronto, Ontario

Capacities:
1½ to 7½ tons.
Tractors to 15 tons.

PERFORMANCE COUNTS

"Largest producers
of Hardwood Flooring
in the British Empire"

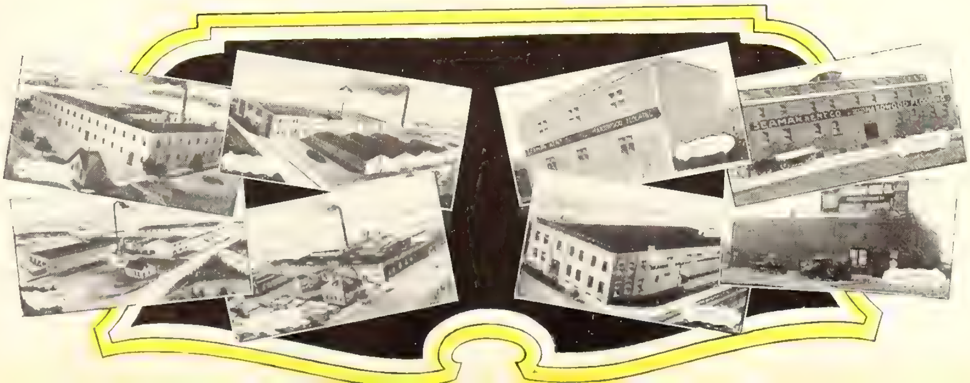
BEAVER
FLOORING
BRAND
TRADE MARK
REGISTERED

Mr. Frank Kent

as Chief Executive of the Seaman-Kent Co., Limited—President and General Manager—controls the policy of the "Largest producers of Hardwood Flooring in the British Empire." Mr. Kent is a thorough believer in up-to-date methods, which accounts in full for the outstanding trade position held by—

SEAMAN-KENT HARDWOOD FLOORING

The manufacturing and distributive chain of factories and warehouses, continually at work supplying the nation-wide demand for Seaman-Kent Beaver Brand Hardwood Flooring, are shown below.



"Organization is the heart of progress"

EDWARD H. STANNERS
Sales Manager.

GEORGE T. BISSELL
Secy. Treas.

ROBERT S. IRWIN
Supt. of Plants

THE extensive and thoroughly modern organization of the Seaman-Kent Co., Limited, is entirely responsible for the firm's premier position in the Hardwood Flooring World of the British Empire. From the timberlands of Canada to the beautiful finished product in Canadian Homes, the work of production and distribution is expertly handled. Four factories and the same number of warehouses, in the East and West, equipped in the most up-to-date manner, carry on the work of supplying the huge demand—ensuring careful attention to raw lumber (proper kiln drying and cooling), highest skill in manufacture, an exacting standard of grading and testing, and finally an unexcelled service of supply to dealer and private purchaser.

Nothing is overlooked that spells success to the consumer. Seaman-Kent Beaver Brand Hardwood Flooring truly lives up to the slogan "Best That's Made in Every Grade".

THE SEAMAN-KENT COMPANY, LIMITED

Largest Producers of Hardwood Flooring in the British Empire

WALLACE AVENUE
TORONTO

Factories: Meaford, West Lorne, Ste. Agathe, Midland.
Warehouses: Toronto, Montreal, Winnipeg, Edmonton.

RESULTS

of the *Steam Shovel Upkeep Cost* Prize Contest

Entries to the ERIE Steam Shovel **Upkeep Cost Prize Contest** have now been given their final rating by the judges. It was anything but easy to select the winners, as more than 300 concerns entered their records in the contest.

The Board of Judges consisted of ARTHUR S. BENT, Bent Bros. Los Angeles, Calif., pioneer contractors on large hydro-electric and irrigation projects construction, and 1922 President of the Associated General Contractors of America; HALBERT P. GILLETTE, Editor of "Engineering & Contracting" magazine, author of "Handbook of Cost Data", "Earth Work and Its Costs", and many other Engineering works; ARTHUR C. VICARY, Vice President of the ERIE Steam Shovel Company, mechanical engineer with many years of specialized experience on steam shovel work.

The FIRST TWENTY awards

1. HERMAN HUEBSCHER, General Contractor, St. Paul, Minn. $100.00 and a solid gold watch, 17-jewel Waltham movement.
2. A. B. COX, Asst. General Manager OLIVE BRANCH NOVACULITE CO., Olive Branch, Ill. $50.00 and a solid gold watch, 17-jewel Waltham movement.
3. F. J. CHAPLIN, W. A. GOULD & BRO., Brisbin, Pa. $25.00 and a solid gold watch, 15-jewel Waltham movement.
4. D. J. HARRY WEBB, Vice-Pres. & Gen. Mgr., CONNECTICUT NATIONAL PAVEMENTS, INC., New Haven, Conn. $20.00 Prize.
5. E. B. PENDLETON, Supt. of Highways, COUNTY OF CHENANGO, Norwich, N. Y. $15.00 Prize.
6. A. E. BAGNALL, Plant Mgr., FULLERS EARTH CO., Midway, Fla. $10.00 Prize.
7. J. S. MORRISON, Mgr., JONESBORO GRAVEL CO., Dee, Ark. $10.00 Prize.
8. H. L. CLARK, Clerk of Board of Highway Commissioners, HAMILTON COUNTY, TENN. $10.00 Prize.
9. BERT R. HARTFORD, MAINE CRUSHED ROCK & GRAVEL CO., Portland, Me. $10.00 Prize.
10. WM. GRAHAM, Contractor, Detroit, Michigan. $10.00 Prize.
11. F. E. GLACE, W. P. McDONALD CONSTRUCTION CO., New York City. $5.00.
12. JULIUS PORATH, Contractor, Detroit, Michigan. $5.00 Prize.
13. C. A. SCHODORF, W. E. CALLAHAN CONSTR. CO., Columbus, Ohio. $5.00 Prize.
14. H. M. ROBINSON, GAY & HAYS, Greensburgh, Pa. $5.00 Prize.
15. H. C. BROWN, Supt. CUMBERLAND SAND CO., Cumberland, Md. $5.00 Prize.
16. H. A. RIDENOUR, WIGGIM CRUSHED STONE & SAND CO., Germantown, Ohio. $5.00 Prize.
17. LOUIS KAHLER, G. H. HEFFNER & SON, Celina, Ohio. $5.00 Prize.
18. OLIVER FROMAN, VIELHAUER COAL CO., Dover, Ohio. $5.00 Prize.
19. GEORGE HOPPLE, Mill & Plant Mgr., PENN. PRODUCTS CO., Dillsburg, Pa. $5.00 Prize.
20. JOS. A. McKAY, JAMES A. McKAY & SON, Detroit, Mich. $5.00 Prize.

—Also "Honorable Mention" awards to many entries which were almost as good as the first 20. These will be published with the others in the Upkeep Cost Record Book. The sender of each "Honorable Mention" record receives a $5.00 prize.

OUR SINCERE THANKS—to every one of the more than 300 concerns who added to the interest of this contest by sending in their records.

Methods used by the Judges in reaching their decisions are fully explained in the Upkeep Cost Record Book, now being printed. This book will give the individual records, also some very interesting averages. For instance there will be a summary for the shovels on earth excavation, another for rock work, etc.

A copy of this book will be sent, on request, **to anyone who does excavation or construction work.** Please send your request promptly, so that we can print enough copies to meet the demand.

ERIE STEAM SHOVEL CO., Erie, Pa., U.S.A.

Incorporated 1883, formerly BALL ENGINE CO.

Builders of ERIE Steam Shovels, Locomotive Cranes, Railway Ditchers.
Export Representatives: Gaston & Co., Inc., 165 Broadway, New York.

ERIE Revolving Shovels ERIE Steam Shovel Co Erie Pa.

Herman Huebscher, St. Paul, Minn., winner of first prize.

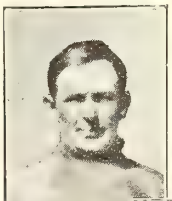
F. J. Chaplin, W. A. Gould & Bro., Brisbin, Pa., winner of third prize.

D. J. Harry Webb, Connecticut National Pavements, Inc., New Haven, Conn., winner of fourth prize.

E. B. Pendleton, Supt. Highways Chenango County, New York, winner of fifth prize.

A. E. Bagnall, Fullers Earth Co., Midway, Fla., winner of sixth prize.

J. S. Morrison, Jonesboro Gravel Co., Dee, Ark., winner of seventh prize.



F. E. Glace, W. P. McDonald Constr. Co., New York City, winner of eleventh prize.

Julius Porath, Detroit, Mich., winner of twelfth prize.

The "Upkeep Cost Record Book" will give full details of many actual steam shovel records. Also gives the averages of a number of machines on the same class of work. It settles the question of "How much does it cost to keep up a well-built shovel that receives good care?"

Mail coupon and a copy of book will be sent you soon as received from printer

ERIE Steam Shovel Co.,
Erie, Pa.

Gentlemen:

As soon as your printer completes the "Upkeep Cost Record Book" please send me one.

Name ....

Address ....

We use (steam shovels) (cranes) for the following classes of work:

....

....

Proof of the Superiority of Waterous Road Rollers

Other Large Purchasers of Waterous Rollers

Warren Bituminous Paving Co.	10
Law Construction Co. - -	5
A. E. Jupp Construction Co. -	5
H. T. Routly - - - - -	8
Dept. Pub. Highways, Ont. -	20
Dept. Pub. Highways, N.S. -	10
B.C. Government - - - - -	
Canada Paving Co. - - - -	
Brennan Paving Co. - - -	3
Hamilton, Ont. - - - - -	3

The above photograph shows two of the Dufferin Construction Company's six Waterous rollers and is just one instance of the extreme popularity of the Waterous double cylinder roller.

In 1921, the Dufferin Construction Co., after making a thorough investigation of the different types of rollers in Canada and the United States, ordered three Waterous Rollers. After using these for a year they purchased in 1922, three more Waterous Rollers.

Nor is this an isolated case of the preference of large road contractors for Waterous Rollers. Practically every contractor in Canada purchases Waterous Rollers exclusively due to their steady, trouble-free performance and exceptionally low cost of up-keep.

WATEROUS ROLLERS HAVE BUILT MORE MILES OF CANADA'S GOOD ROADS THAN ALL OTHER MAKES COMBINED

Waterous

BRANTFORD, ONTARIO, CANADA

ESTABLISHED 1886

Contract Record and Engineering Review

A National Journal for the Construction Interests of Canada, reaching Architects, Engineers, Contractors Municipal Officials, etc.

Published Each Wednesday by

Hugh C. MacLean Publications
LIMITED

THOMAS S. YOUNG, Managing Director

HEAD OFFICE - 347 Adelaide Street West, TORONTO
Telephone A. 2700

Proprietors and Publishers also of Canada Lumberman, Electrical News, Canadian Woodworker, Furniture World and Footwear in Canada.

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WINNIPEG 302 Travellers' Bldg.
VANCOUVER Winch Building
NEW YORK 296 Broadway
CHICAGO 14 West Washington St.

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Vol. 37 Toronto, April 25 1923 No. 17

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Training in the Selection of Men

Very frequently the foremen, hiring clerks or other officials of a construction organization whose duty it is to take on new employees are incapable of picking the right men. Were they properly trained in the art of selecting individuals to fit the job we would not see as often as we do crews of workmen who are unfamiliar with or unsuited for the work they have to do. Efficiency is largely dependent on having men qualified for the job and in the selection of such, the foreman has an important responsibility.

To illustrate the need for foremen trained in the selection of men, "The American Contractor" prints a little story with some comment. It is as follows:

An experienced building laborer came into an eastern city last week for family reasons. Needing work, he scanned the pages of want ads and went out to one of the jobs advertised. Approaching the foreman, who was sourly contemplating the efforts of a partially completed crew, he asked for work. "Sure I need men, experienced men," said the foreman. "Have you had any experience?"

"Worked for four years on buildings as laborer, steel worker, and carpenter's helper," was the answer of the applicant.

"Where at?"

"On the West Coast—Seattle, Tacoma, and British Columbia."

The foreman was skeptical. The references were certainly vague and the places far enough away. "Huh!" he said, "I've got plenty of dubs like you that don't know which end of a shovel goes in the ground. Can't use you. I want men who know how to handle themselves and won't be in their own way."

"Never stepped on my own feet yet," said the applicant who needed the work. But the foreman dismissed the idea of employment and went on his way to the shack to look over the blueprints.

The job hunter watched the crew for a few minutes. His eye detected, among the workmen, their lack of familiarity with their work. He determined to go to work on that job, and for an hour plagued the foreman with his presence. At last, out of desperation, the foreman told him to come to work in the morning, but added, "All of you inexperienced men will get the sack just as soon as this excavating job gets along."

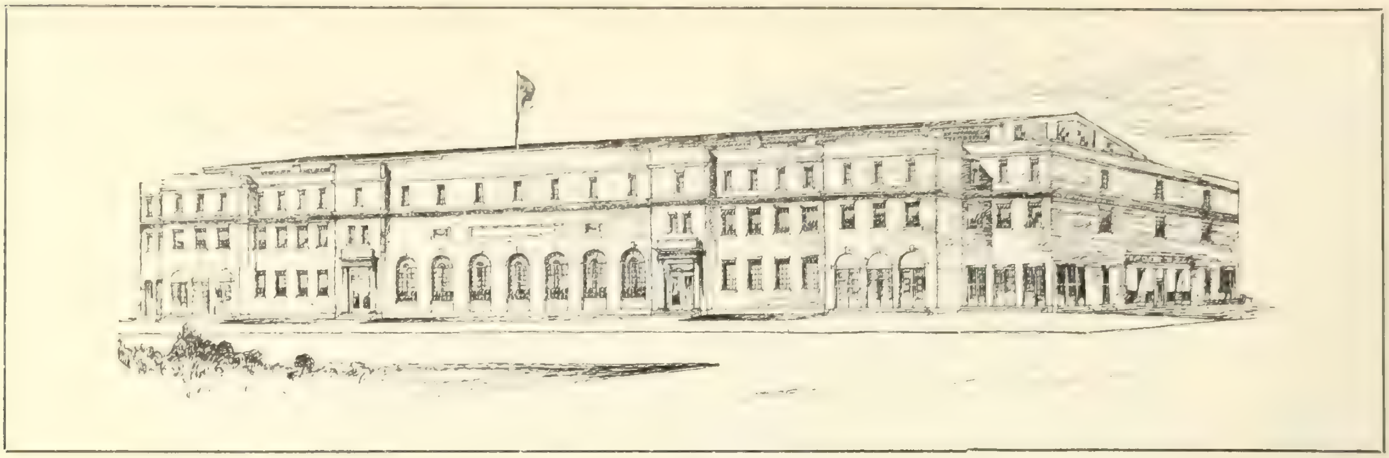
The next day found the new man on the crew. He knew what to do and did it easily without apparently straining himself. His example in many little job matters was followed by the rest of the crew, none of whom would have thought out for himself the easier methods. Before the morning was over the foreman said to the new man from the west, "I see you know something about this work all right."

The point of this commonplace story is that most foremen have not been trained in the selection of employees. Contractors who take this important matter up with their foremen and carefully work out plans for picking the experienced men will have greater success in getting crews which can co-ordinate their activities and efficiently do the work. A few experienced hands will be a great leavening for the whole group when it comes to executing the jobs without friction.

A foreman who has been impressed with the need to ask a few simple questions about the conduct of a job can find out quickly how much real experience an applicant has. It would be quite plain that the man who thought he could carry footings up to the first floor if, they were not too heavy, had had his building education neglected. Hasty judgment in selecting a workman is likely to turn a good man off the job, and good men are needed by contractors this summer as never before.

Error in Company's Name

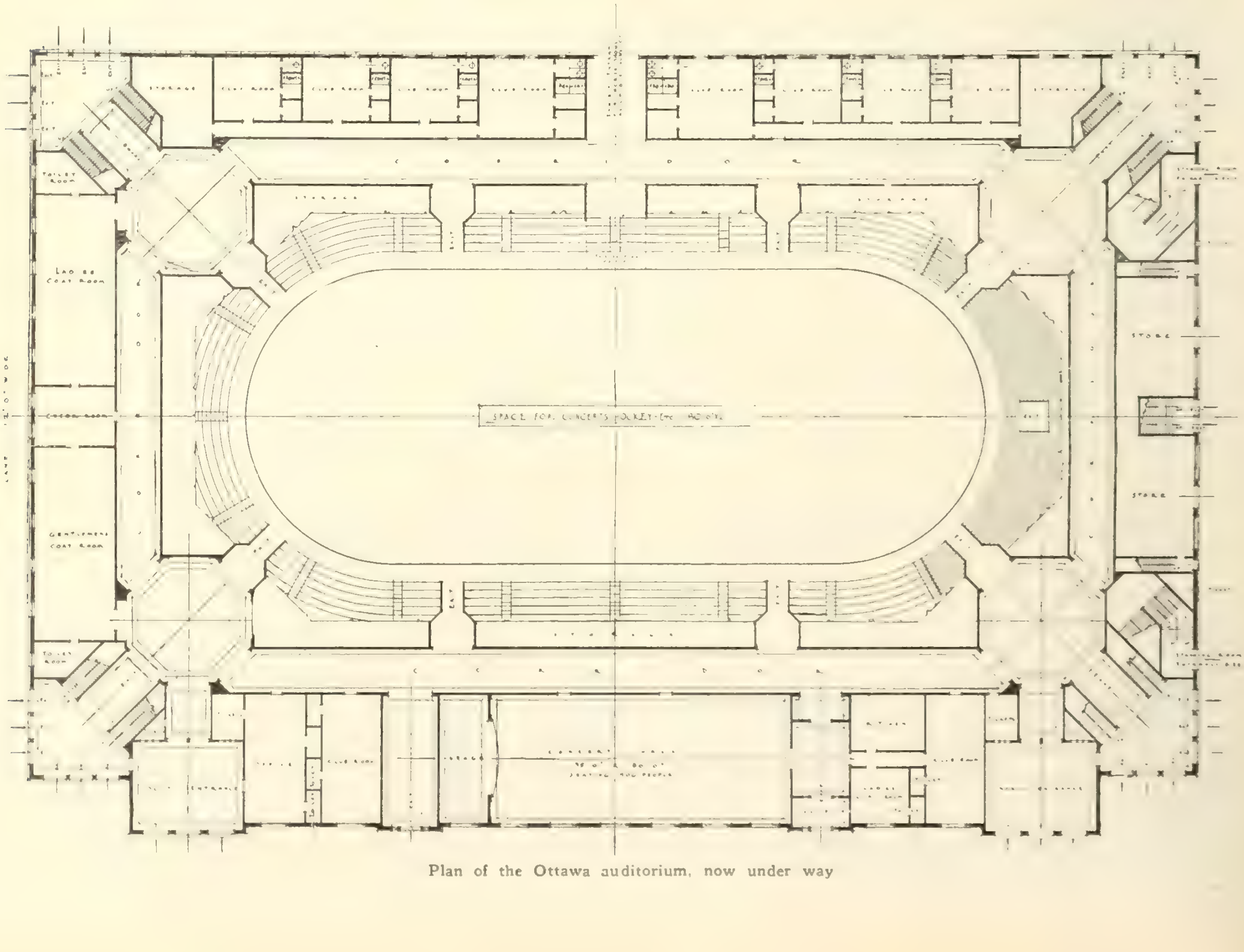
In the Incorporation Notice column of our April 11 issue, page 356, we referred to the incorporation of "Ross & Brazier Construction Co. Ltd. This should have read "Boss & Brazier Construction Co., Ltd."



Large Community Building For Ottawa

The Auditorium Ltd. Has Awarded Contracts for the Construction of a $350,000 Fireproof Hall Capable of Holding 10,000 People —Details of the Design

A syndicate composed of business men of Ottawa has obtained letters patent for a company known as The Auditorium Ltd., through which Ottawa will be provided with a great fireproof community building capable of holding 10,000 people. The main building will also contain a smaller hall suitable for small meetings and which will have a seating capacity of about 800. It will also contain rooms which will be utilized for offices of Associations, committee meetings and other purposes. The site on which the building is being erected measures 305 feet on O'Connor St. and 321 feet on both Argyle Ave. and Catherine St., the location being most central and only a very short distance from the two main thoroughfares, Sparks and Bank Streets. The personnel of the syndicate are: Messrs. T. F. Ahearn, director of the Ottawa Electric Railway Co., and president, Ottawa Hockey Association; and the Ottawa Car Mfg. Co.



Plan of the Ottawa auditorium, now under way

Major F. D. Burpee, manager, Ottawa Electric Railway Co., and W. H. McIntyre, general manager, Ottawa Car Mfg. Co.

Safety is a special feature in the design of the Auditorium. The building will consist entirely of steel, brick and concrete and all seats will be of reinforced concrete. Contracts were let some time ago and men are at work pushing it ahead with all possible speed. The building and equipment will cost in the neighborhood of $350,000 and steps have been taken so that all materials, if possible, to go into the building will be made or bought in Ottawa.

The exterior walls of the building will be constructed of high grade tapestry brick with Indiana limestone trimmings. The metropolitan system of fireproof roof construction, used by the Keystone Gypsum Fireproofing Corporation of New York, has been adopted. All interior partitions will be faced with first quality of smooth pressed brick. The building is designed to be absolutely fireproof. It will have twelve exits and it will be emptied of its 10,000 people in five minutes.

There will be an artificial ice surface of 200 x 80 feet; the plant for this will require 10 miles of piping. The heating system will be so controlled that the temperature during skating and hockey games will be kept at between 40 and 50 degrees. As soon as the winter season is over, a sectional hardwood floor will be laid over the skating surface and will carry a stage and chairs converting the rink into a concert and meeting hall capable of accommodating comfortably from six to eight thousand people.

The contract for the drawing of the plans was awarded after competition to the firm of Richards and Abra, architects of Ottawa, and credit is due to them for the splendid outside appearance of the building and its inside arrangement. The successful tenderers are the following: Concrete and brick, T. C. James; structural steel, Dominion Bridge Co.; plumbing and ventilating, McKinley and Northwood; gypsum block roof, the Keystone Gypsum Fireproofing Corporation, New York city; roofing and cornice, McFarlane and Douglas; painting and glazing, W. J. Carson; electric wiring, F. Wilson. The small amount of carpentry work will be done by the Auditorium Co. by day labor. The company has engaged the services of Major F. P. Sims, consulting refrigerating expert to advise them in the making of the machinery for the ice making plant.

Entire Town Moved by Motor Truck

One Hundred Houses Conveyed a Distance of Eleven Miles on Specially Built Trailer which Made Wholesale Transportation Possible—How Operations Were Carried on

At some time or other every contractor has been faced with the problem of moving a building to some other location. In every Western town it is a common sight to see houses or barns being transported through the streets with a long string of horses as the motive power.

But if a contractor was asked to figure on the job of moving an entire village, lock, stock and barrel, he might be excused if he declined to tackle it. Nevertheless, it has been done, and successfully too, without injury to the buildings, save several windows were broken by tree branches while en route.

Of the late years the development of the automotive industry has made possible the moving of heavy machinery and buildings, such as would have been called impossible a decade ago. This is the story of one such feat, accomplished by the Acme Motor Truck Co., of Cadillac, Mich., which firm, by the construction of a trailer of unusual size and design, moved an entire village a distance of eleven miles over country roads.

The town of Jennings, 11 miles north and east of Cadillac, was founded more than a quarter of a century ago by the Mitchell Bros. Lumber Company. A saw mill, chemical and flooring plant gave employment to approximately 500 men. Jennings was a "company town," for though it had a number of churches, "opera house," roller skating rink, community house, band stand, jail and other civic buildings, there was but one store in the village, that a general one, carrying all sorts of supplies. About every able bodied man in the village was employed in one of the company mills. When the little town was founded, the unbroken hardwood forest surrounded the village for miles and miles in every direction. A beautiful little lake nestled among the hills, the waters of which were alive with gamey bass, pike, perch of unusual size and many other varieties of fish. Life there was almost ideal, and the needs of the inhabitants simple.

The Mills Shut Down

But as the years rolled past, the standing timber around the village gradually disappeared before the onslaught of axe and saw, until a few months ago the last of the big trees fell and then it was only a question of time when the fires would be drawn and silence fall over the hills.

Various plans were considered for the preservation of the industrial life of the happy, contented village, but all were discarded. Then was born the idea of moving the mills, the families and the residences to Cadillac, eleven miles southwest. Many plans were considered and rejected as impractical before the motor truck and trailer was considered. Finally W. A. Kysor, President of the Acme Motor Truck Company, submitted a plan to the lumber company, which was accepted, and a gigantic trailer was built.

The next thing to be considered was the road over which the many big loads would have to pass. About 8 miles of the distance is over the Michigan Trunk Line, the rest of the way over a fairly good dirt road. Considerable work had to be done on this highway, the road bed widened at a number of points, and in all cases of this kind, heavy planks or timbers were laid smoothly to make a level roadway. A bridge across the Clam River was widened and reinforced.

In the village, entire streets were paved with heavy green planks to sustain the weight of the load, as the soil there is largely loose, soft sand.

Breakage Practically Nil

The houses to be moved vary in size from 24 x 30 to 24 x 40 feet. Many of them have hardwood floors, all are a storey and a half high, well built, comfortable and arranged for convenience. The weight of the houses is from 15 tons up. The windows are left in all of them, and so perfectly was the trailer designed that there is not the slightest jar in any part of the journey, and not a window cracked except when passing through the city of Cadillac the limbs of shade trees along the streets broke one or two occasionally.

The 11-mile trip is made in about 4 hours, although loading and unloading and passing through the city required a longer time than that, as it is often necessary to remove the electric light and telephone wires to allow the house to pass under.

At the time this article was written the rate of moving is about two houses every three days, or four per week. There are from 75 to 100 of these residences to be moved.

In addition to the houses both the flooring and the chemical plants are to be moved, which makes this project the most extensive of its kind yet attempted, though a short time ago a complete village was moved a distance of half a mile by horse power, but the plaster was badly cracked in most of the houses, while all of them were more or less wrenched and pulled apart.

This wholesale migration of the methods used in making it possible have attracted widespread attention and many magazines have described the methods and machinery used.

Description of the Trailer

The trailer is constructed with a framework of heavy structural steel beams. A channel and I-beam platform, raised 18 inches above the trailer frame, and rigidly connected to it, transfers the load at the forward end of the trailer to a rocking fifth wheel mounted on the truck. This construction eliminates all twisting stresses from the trailer proper.

The trailer frame is supported at the rear by four steel truck wheels abreast, equipped with solid rubber tires. These wheels are placed under the trailer in such a position that approximately 75 per cent of the weight of the trailer and load is carried on them, making it possible to carry a very heavy load on the trailer without overloading the truck used for motive power.

The trailer is designed to safely carry a maximum, uniformly distributed load of 35 tons, and the complete unit (trailer and truck) weighs approximately 12 tons.

The trailer proper is 24 feet wide by 42 feet long. It consists of five longitudinal members of heavy section structural steel, securely held in place by two main and four supplementary transverse beams. Diagonal cross braces are built into the frame to distribute the stresses where excessive weaving and twisting would occur. To give rigidity and strength to the structure, the three centre longitudinal members are reinforced with large truss rods securely anchored to the members at each end and supported at equal intervals by cast iron struts. The tension in these rods is equalized by a series of turnbuckles. All frame connections, gussets, braces, etc., are hot riveted, the entire frame reflecting the skill of our structural workers.

The platform at the forward end of the frame is raised 18 inches above the trailer. It is constructed of channels, I-beams and plates, and substantially braced with diagonal members to the forward transverse member of the trailer proper in order to eliminate side sway. This platform is connected to the trailer frame by means of heavy gusset plates and channels of sufficient strength to safely transfer approximately 25 per cent of the weight of the trailer and load to the rocking fifth wheel mounted on the truck.

At the rear the trailer is carried on four cast steel truck wheels, all abreast, equipped with 40 x 6 dual truck tires. The wheels are arranged in pairs, each wheel operating on tapered roller bearings supported by a tubular steel axle shaft. The shafts of each pair of wheels are bolted together at the center through a large steel casting which is supported by an extra heavy wrought iron pipe extending through it and at right angles to the shaft. Heavy steel pillow blocks at either end of this pipe support the weight of the trailer and load through coil springs, attached to the trailer frame. This unique construction not only cushions the load, but successfully provides for road inequalities, which is very essential when taking into consideration that the distance between the outside wheels is approximately 11 feet.

To relieve the springs from driving stresses, a radius rod with flexible connections is provided for both sets of wheels, the forward end of which is secured rigidly to the trailer frame and the rear end fastened to the end of the wrought iron pipe through a swivel connection.

In order to maintain perfect alignment of all four wheels, the wrought iron pipes supporting the axle shafts are tied together by a system of flat bars secured to the trailer frame and so arranged as to compensate for spring deflection.

The house is raised by a series of jacks located at each side. The two outside longitudinal members of the trailer which are bolted on, are removed. The trailer is then backed under the building and the house is lowered until it rests evenly on the trailer frame. The side members are replaced if it is found necessary, and the unit is ready for its journey.

The motive power for this big contract was a standard Acme Model 125 chassis, equipped with a Continental motor, which developes 55 h.p. actual break test. This power, together with a gear reduction of approximately 71 in first speed, easily negotiated a 6 per cent grade, 600 feet long, over a gravel road with a 35-ton load on the trailer.

President Francis of the E.I.C. Honored

Recognition of the long and valuable services of Walter J. Francis, newly-elected president of the Engineering Institute of Canada, to the Institute and to the engineering profession at large, was accorded in a luncheon tendered by the Toronto Branch in his honor at the King Edward Hotel on Thursday, April, 19th. Short introductory addresses were given by the three past presidents resident in the Toronto district, C. H. Rust, M. J. Butler and Dr. R. A. Ross. In reply President Francis discussed the problem of fuel in Canada.

American Water Works Association Plan Important Meeting at Detroit

The Tentative Program Discloses an Interesting Array of Topics for Discussion—Superintendents Will Hold Special Sessions —May 21 to 25 Are the Dates

The 43rd annual convention of the American Water Works Association will be held in Detroit, Mich., with headquarters at the Hotel Statler. The dates are May 21 to 25. The committee has tried to arrange a program with something to interest and help all classes of membership. The manufacturers' section are arranging exceptionally good exhibits of water works appliances. The following is the tentative program:

Monday, May 21

Secretary's Office, in Hotel Statler, will be open for registration at 8 a. m.

At 2 p. m. the Superintendents and others interested will hold a "get acquainted" meeting, at which various practical water works subjects will be informally taken up.

At 2 p. m. a meeting will be held in the Water Works Office, Randolph and Jefferson Sts., Detroit, to discuss matters relating to water works accounts, records and reports.

In the evening there will be an informal reception and dance.

Tuesday, May 22

Forenoon, nine o'clock:

President's Address.

The Use of Constant and Variable Speed Motors for Driving Water and Sewage Pumps, by L. F. Adams, General Electric Co.

Water Works Pumping Stations, by Charles B. Burdick.

Determining the Proper Equipment for Pumping Stations, by Arthur L. Mullegren.

General Business.

Afternoon, two o'clock:

Records of Stream Flow, Their Use and Best Methods of Obtaining Them for Municipal and Industrial Purposes, by C. C. Cocert, W. & L. E. Gurley Co.

Collection and Daily Publication of Meteorological Data by the Water Department, by Scotland G. Highland.

Some Recent Large Water Works Projects, by Dabney H. Maury.

The Design of the Proposed Water Filtration Plant at Baltimore, by James W. Armstrong.

Election of members of nominating committee.

Evening, eight o'clock:

The Water Works of Detroit, by George H. Fenkell.

Detroit Filtration Plant, by Theodore A. Leisen.

Wednesday, May 23

Forenoon, nine o'clock.

Recent Water Developments at Memphis, by James R. McClintock.

A Rational Method of Paying for Water Works Construction, by Caleb M. Saville.

Municipal Team Work, by Frank C. Jordan.

Selection of 1914 convention city. Special order for 11:30 a. m.

Afternoon, twelve o'clock:

Visit Detroit filter plant, luncheon at plant and return by boat.

Evening, half past seven o'clock:

Program By Water Works Manufacturing Association

The Manufacture of a Twenty-Inch Gate Valve (presented with moving pictures), by James H. Caldwell, Ludlow Valve Mfg. Co.

Making it Lighter and Making it Better—A presentation in moving pictures of the manufacture of cast iron pipe, by John D. Capron.

Installation and Recovery of Brass Well Screens (illustrated by moving pictures), by D. R. Johnson.

Thursday, May 24

Forenoon, nine o'clock:

Water Shed Protection.

Industrial Wastes in Relation to Water Supply.

Standard Specifications for Cast Iron Pipe.

Steps Toward Standardizing Stated Quantities for Slides in Meter Schedules.

Afternoon, two o'clock:

Standard Methods of Water Analysis.

Standards for Satisfactory Drinking Water.

Practical Ranges in Load Factors for Purification Plants.

Colloid Chemistry in Relation to Water Purification.

Evening, eight o'clock:

The Chemical and Bacteriological Section will hold a joint meeting with the Detroit Section of American Chemical Society.

Pumping Station Betterments.

Physical Standards for Distribution Systems.

Standardization of Services.

Methods and Records of Waste Control.

Friday, May 25

Superintendents' Meetings, forenoon at 9 o'clock, afternoon at 2 o'clock.

* * *

Chemical and Bacteriological Section
Thursday, May 24

Joint Meeting With the Detroit Section of the American Chemical Society

Evening, eight o'clock:

Hardness of American Municipal Water Supplies, by W. D. Collins.

Corrosion of Hot Water Systems, by C. R. Texter.

The Removal of Dissolved Gases from Water, by J. R. McDermet.

Friday, May 25

Application of Physico-Chemical Research to Purification Problems

General Introduction, by J. W. Ellms.

Micro-Forces, with Reference to Orientation and Curvature, by Frank Hannan.

Theories of Coagulation, by A. M. Buswell.

Studies of Aluminum Hydrate, by William Mansfield Clark.

The Use of Acids with Alum, by G. F. Catlett.

The Use of Chlorine with Alum, by Robert Spurr Weston.

Mixing Devices and Reaction Time, by Charles P. Hoover.

Thickeners, by Paul Hansen.

Recarbonation, by Nicholas S. Hill, Jr.

Filter Unit Details, by Malcolm Pirnie.

Sand and Gravel Sizes, by F. Holman Waring.

Superintendents' Program

A special effort will be made to make the Detroit convention of special interest to operative water works members—superintendents. An informal, get acquainted, meeting will be held at 2 o'clock Monday afternoon, and at 2 p.m. a group meeting will be held in the Detroit Water Office, Cor. Randolph and Jefferson Aves. to discuss matters relating to water works accounts, records and reports.

The general program for Thursday afternoon will be devoted to reports of standardization committees on technical chemical subjects and the superintendents will have a group meeting, devoted to question box, topical discussions and general "round table" talks.

On Friday, the chemical and bacteriological section sessions will be held and the superintendents will have the full day for their separate meetings, continuing the discussion of operating topics.

The following questions have been proposed:

1. When water is furnished at "flat rates," what is done when the consumer claims he does not sprinkle although he has hose connections?
2. Where there are several families using water through one meter, how can the collections be divided?
3. Are deposits demanded where water is furnished by meter; if so how much and does the company or department pay interest?
4. Are consumers allowed to do plumbing for themselves; if so how is the department or company to keep records where service is on flat rate basis?
5. What progress is being made in the adoption of the standard thread for fire hydrant nozzles?
6. Painting fire hydrants, best color from fireman's standpoint and from protection to hydrant point of view.
7. Fire protection service of the water department; should it be paid with water rates or from general tax fund?
8. Direct fire pressure vs. portable pumping apparatus.
9. Use of fire hydrants for other than fire fighting. Other means of supplying street sprinkling and flushing wagons where hydrants are not used.
10. Steamer connections (4½") on supplies having high pressure, 75 pounds or over. Are they necessary or their requirement reasonable?
11. Use of various solutions to clean water services; effect on the pipes of the use of solutions. Other methods of clearing clogged water service pipes.
12. Check valves on services; liability for damages to house boilers caused by their use and advisability of using them. Damages to meters from hot water when no check valve installed.
13. Who pays cost of meter repairs when damaged by hot water?
14. Legal decisions on setting meters; right to set meters over objection of property owner.
15. General discussion on setting meters on new consumers or on old ones formerly on flat rate. What notice should be given consumer and what time for making repairs and stopping leaks after meter is set before charge is comenced on meter rate.
16. Legal decisions on right to charge more than one minimum rate or service charge on multi-family houses.
17. Experience with flush flow water closets, those using no tank. Size of service required where such closets are used. Regulations concerning their installation. This is a live question as very large services are being demanded for such closets and the large flows required may involve water hammer trouble. Water works authorities should regulate their use before they are in too general use.
18. Location records of water services, how kept and what should be shown by them.
19. Control of lawn sprinklers regulation of hours of use on flat rate basis and on meter rate basis.
20. Use of compressed air tools in water works operation and construction, use in cutting out asphalt pavement and concrete sub-pavement. Use for caulking mains, etc.
21. Use of power or gasoline pumps for trench work.
22. Shooting or dynamiting artesian and other deep wells to increase flow.
23. Boiler room practice and appliances. Use of regulators, feed water heaters, oil removers, mechanical stokers, etc.
24. Laying water mains or services in trenches with sewer pipes; should it be permitted under any circumstances, if not what are the reasons for not doing so?
25. Effect of atmospheric conditions on steam making.
26. Hard water; house remedies where public softening not feasible. What hardness costs in soap and other disadvantages of use of very hard water.
27. Copper sulphate treatment, a study of quantity required for various types of algae, effect of temperature, etc. Some practical experiences wanted.
28. What states have training schools for filter operators and what ones require examinations and licenses for such operators, a discussion of the advisability of such state control.
29. Water for locomotives, any restrictions as to sale because to be used outside of the city where sold.
30. Service pipes, who pays for installing and who pays for repairing and maintaining. What is your practice?
31. Master meters, selection and installation of one or more meters on supply or pump discharge lines, to check up work of small meters in metered systems and check consumption in flat rate systems.
32. Empire fire hydrant, is it now made, if so by whom and by whom used?

33. Cast iron pipe laid in slag or soft coal ashes, observations and data on corrosive action requested.
34. Legal decision on damages caused by bursting or leaking water mains. To what extent is a company or department liable for such damages?
35. Legal decisions on penalty charge when water is shut off for non-payment of bill. Regulations of boards of health concerning such shutting off of water supply.
36. Blown out joints in cast iron pipe, methods of repairing and stability of such joints after repairs are made.
37. Private fire protection services, data wanted on charges for such service. If sufficient data obtained it will be tabulated for the use of members.
38. Recording gages, their use and benefits from them, what do they tell us concerning water use and waste?
39. Use of the camera in records of work, breaks, defense in damage actions, etc.
40. Forestration of water sheds, work done, benefits derived.
41. Packing and lubrication for valve stems and fire hydrants.
42. Frost penetration in different soils and in rock cuts.

Supplying Water For Contractors' Use[*]

In Furnishing Water For Construction Purposes, An Attempt Should be Made to Overcome Waste, Which is Very Prevalent Among Contractors

To many utility operators the use of water by contractors may be a relatively unimportant matter, on account of the comparatively small per cent of the output that is furnished for that purpose, and the methods used in collecting for the same.

In some places water is furnished contractors by water measurement, and where it is practicable to do so the problem is quite simple, and the speaker also believes it is the most just and equitable way to sell water. However, local conditions in some cities and towns make the meter plan of furnishing water to contractors quite expensive to successfully adopt; charges are made on a "flat rate basis" and my remarks will apply more especially to the flat rate plan of assessment.

It is assumed that every operator charged with the responsibility and management of a public utility makes it his business to render to the public the best possible service at all times, remembering that the "best is none too good," and strives to make all customers satisfied. If he does not, he is a misfit. Among his many other duties, his attention should also be given to reducing the percentage of "leakage" or "water unaccounted for" to a minimum, as the extent of this item largely determines the degree of success or failure of the enterprise from a financial standpoint. In his endeavors to stop leaks and improve plant efficiency he is made acquainted with the "flat rate water waster" and his methods.

Waste Stopped

If, in the majority of cases, he succeeds in actually stopping the waste and always retains the good will of his customer he has accomplished a task of no small proportions and is a born diplomat.

The percentage of water sold contractors by our company during the building season months, if figured at our regular meter rates, ranges from 3 per cent to 8 per cent of the total. In the great majority of cases we furnish them water on a flat rate basis, and during the warmer months, when construction work is carried on in a general way throughout the city, the water wasted by them is relatively large, and by investigation we believe the waste sometimes exceeds all legitimate uses many times.

In an average case, the contractor first makes application and pays for water to be furnished for certain specific purposes, etc., which we figure from blue prints he submitted to us. A few days after the application and the tap are made, our inspector visits the premises, notes the uses and abuses, if any, and frequent inspections are continued during the progress of the work. In checking up in the field, the uses, quantities, etc., applied and paid for, it is a common thing to find that water is being used for purposes not authorized, or for uses in excess of quantities applied for. However, the worst thing we have to contend with is the comparative great waste.

In our city (Gary, Ind.) most of our mains are laid in the alleys, and our company taps its main and installs the service pipe to the property line at its own expense. At the rear property line, the contractor has a temporary riser pipe and connection installed for use during the construction, and from 75 lin. ft. to 100 lin. ft. of ¾-in. hose is used to conduct the water from this riser pipe to the place where it is wanted. It is a very common occurrence for our inspector to find a full flow of water being discharged and wasted through the hose. Usually the contractor is absent, and when the foreman or workman are asked why they waste the water, they simply say that someone forgot to turn it off, or that it makes better and cooler drinking water to allow it to run, or that it is too inconvenient and takes too much time to reach the faucet or valve on the riser pipe so often.

As our city is built on sand, this material makes an excellent sieve for the wasted water to pour through without annoying or inconveniencing the workmen or any other party, and it is very difficult at times to detect waste because only a small spot on the surface (about 6 ft. to 8 ft. in diameter) is flooded; and if they see our inspector first, no waste is found, but as soon as he leaves the evil may continue without detection. Under the pressure we carry the water discharged through 75 ft. of ¾-in. hose, flowing only one-half the time of the working hours during the construction period of an ordinary dwelling, say 90 days, will amount to approximately $30 by meter at a monthly rate of 25 ct. per 1,000 gal. for the first 20,000 gal., and 10 ct. per 1,000 gal.

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[*] By Wm. Luscombe, vice-president, Gary Heat, Light & Water Co., Gary, Ind., before the Indiana Sanitary and Water Supply Association.

for the excess. In furnishing water for building purposes in the construction of such a structure we usually receive about $3.50, so it is very plain no inspection charges or abuse of privileges is provided for or included in that amount, and where considerable waste is practised, this service is furnished at a loss to us and has benefitted no one.

Penalties for Water Waste

We caution each violator in a friendly but firm way against wasting the water, and for the third offense, discontinue the supply and refuse to again turn it on until assurance is given us that he will use and not abuse the privilege, and then pays $1.00 for resuming the service.

Occasionally it is necessary for a violator to have this experience two or three times before he acquires a sufficient education to learn that waste is not tolerated. We have now concluded that in cases of repeated and flagrant violations, instead of discontinuing the supply for just cause, we will in addition require the offender to provide a suitable place for a meter, where it will be accessible for reading and repairs at all reasonable times, and furnish him water only at the regular meter rates.

One might ask, why not do this in the first place? The answer is that because of local conditions and the methods used in installing the water service and sewer pipes, from the rear property line into the premises, the plan is a rather costly and not altogether satisfactory one. It would cost between $14 and $18 to provide a suitable place for a meter to be placed in a temporary vault, located near the alley line, and we are opposed to placing this burden on the consumer if it can reasonably be avoided. Also meter vaults are sometimes found covered or broken by building material, rubbish, etc., filled with sand, or the meter damaged, changed to an improper position so it does not accurately register, or disconnected. It will thus be observed it is not an ideal solution to the problem, but with special care and interest taken we believe we can minimize these troubles and check the water wasters.

One might also inquire that as our services are about 100 per cent metered for permanent uses, and as all of our meters are inside settings, usually in basements, why not at the commencement of building operations have the permanent service pipe installed from the alley line into the premises? And the answer is, because the sewer pipe and an extra strong lead water service pipe are laid in one wide trench, the water pipe being above and to one side of the sewer pipe; and as the contract for the trench work in which to install these pipes invariably is not let until after the building construction is well under way, a temporary water connection and riser near the rear property line is installed for immediate use.

Water for Other Purposes

While most of the contractors' cases we handle in point of numbers are those pertaining to uses to be made of water in the construction of dwellings, apartments, stores, etc., numerous demands are also made on us to furnish water for the improvements of streets and alleys, cement walks, and miscellaneous uses where water is wanted to be drawn from public fire hydrants.

We have always taken the position that public fire hydrants should be used exclusively for fire purposes, as they are not designed or intended for other use. We are very proud of the service we have given the city and its citizens for extinguishing fires since the water system was first installed, about 16 years ago. We attribute our success for these services largely due to the fact we maintain all public fire hydrants in good condition, and forbid the promiscuous use of them, and immediately after any of them are used they are inspected, so we make sure they are left in proper condition.

When the only available means of obtaining the water for special purposes is from them, only in such cases is their use permitted. A permit is then issued by us, but revocable at our pleasure, provided the applicant first obtains written permission from the chief of the fire department for that privilege, and delivers the permit to us. Daily inspection is made of hydrants used in the built-up portion of the city, and frequent inspections are made of any others so used. Permission is not granted to use hydrants for such purposes during the winter months. We seldom have hydrants used without authority, for there is a city ordinance penalizing such actions.

When hydrants are permitted to be used, a spare nozzle cap is usually converted into use as a reducer, and with the use of a nipple and valve connected to the reducer the small valve is then operated by the contractor, and this obviates the necessity of the frequent operation of the hydrant main valve. When a continued use is desired from any particular fire hydrant and it practicable to do so, we furnish the water by meter measurement.

Meter Measurement the Best

The writer firmly advocates that the water furnished to contractors be by meter measurement wherever it is practicable to do so, and the meter can be set at a nominal cost, as this is the fairest way to determine and assess the just charges for the commodity supplied. In practical operations, I believe that where this plan is adopted, in the majority of cases it would result in lower water bills, because the contractor would then make it his business to see that waste was practically eliminated and he would profit accordingly. Also the utility could economize and dispense with the frequent visits to the job by the inspector as made under the "flat rate" or "guesswork" plan, which visits are offensive to the contractor because of the disagreeable notices he is obliged to serve to curb waste. I also believe the relations between the utility and the contractors would be far friendlier, which is very much to be desired.—Paper presented before the Indiana Sanitary and Water Supply Association.

The Dominion Bridge Company have just completed the first half of their fiscal year and report that business has been very much better than for the corresponding six months of the previous year. About 550 men are now employed and a large number of smaller orders, and a smaller number of large orders remain to be filled. March is reported to have been the busiest month for a long time. Some large orders have recently been received by the Dominion Engineering Works, which is a subsidiary of this company. The western plants of the Dominion Bridge Company are also said to be working along satisfactorily. With the 1923 business season opening up, as it is, the structural end of this company's business will doubtless show a much better record than last year.

Laying Underground Electric Services in Rural Districts

Cables Laid in Trenches Which are Opened up by a Plough Drawn by a Tractor—Trenches are 12 to 18 ins. Deep and the Wires are not Protected by Other Than Earth Backfill

The Hydro-electric Power Commission of Ontario has been undertaking in an extensive way the delivery of power direct to the individual in the rural district. Thus the farmers of Ontario are receiving the same amenities from an electrical point of view as are the city dwellers.

For the distribution of the electrical energy, poles and overhead transmission lines are generally used but in 1921, due to the great increase in cost of labor and material, which made itself evident in this as in other classes of construction, the Commission's engineers investigated the possibilities of underground construction in rural districts. The use of cables laid underground is, of course, a well established practice and in fact antedated the use of pole lines. The application of underground cables to the rural service is however, quite new, and the methods of installation and the details of design were given considerable study. To date a total length of 150 miles of cable has been laid underground and is operating successfully.

The standard cable is briefly described as follows:

Single conductor, No. 6 B & S gauge, 7 strand copper, insulated with 30% para rubber 3/32 inch in thickness, laid over with a rubber filled insulating tape and covered overall with a pure lead sheath, 1/16 inch thick. This cable is furnished in uniform lengths of 1/3 mile each.

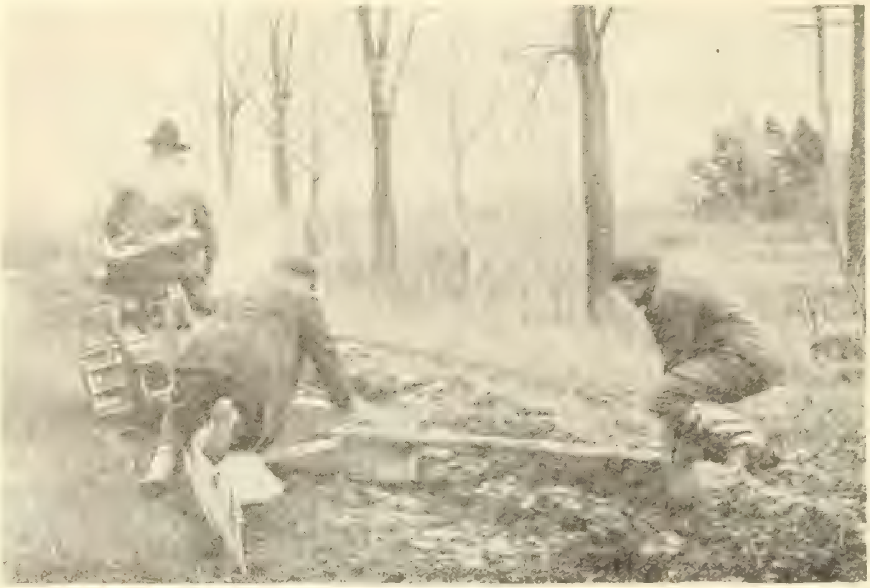
The cable is laid in a trench at a depth of from 12 to 18 inches and is not protected by a duct or covering other than the re-filled soil, except at hazardous locations such as road crossings, where a creosoted plank is placed above the cable after a few inches of the excavated soil has been refilled.

Opening the Trench

The trench is made by a grading plough, of exceptional strength, drawn by a caterpillar tractor. The plough is designed to turn a furrow 18 inches in depth. It is fitted with a heavy coulter which readily cuts through tree roots 4 inches in diameter.

The tractor is also used to draw a carriage on

These two views show the type of plough and the tractor used in opening up the trench preparatory to laying the cable. The trenches are from 12" to 18" in depth. Very little hand work is necessary.

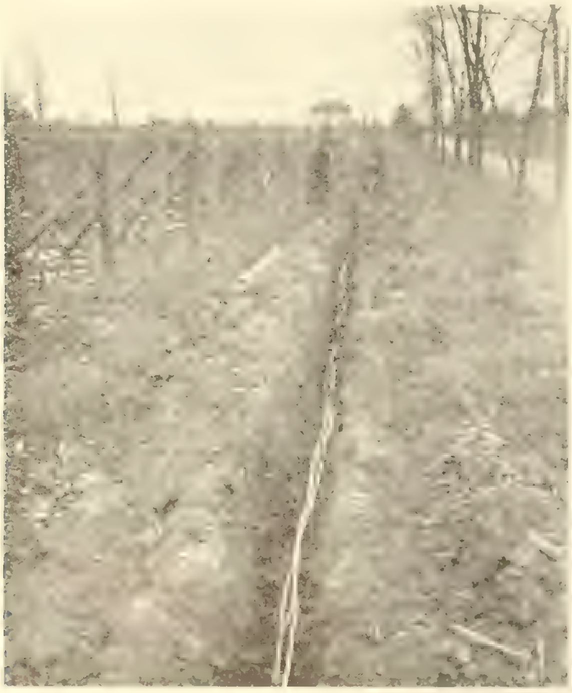


These views show the cable laid in the trench and the process of refilling. The upper picture also gives a good idea of the average location of the trench in relation to the road and the property line.

which the cable reel is mounted and from which the cable is laid in the trench with a minimum of handling. The tractor is also used to draw a scraper for refilling the trench.

Cable joints are enclosed in lead sleeves, compound filled, and sealed with wiped joints to the cable sheath.

At points where service to consumer is required, a wood pole is set and the cable is carried up the pole, terminating in a disconnecting pothead; continuing the circuit along the highway, the cable is carried down the pole again from a second pothead. This method eliminates the necessity of a joint at the foot of the pole and the disconnecting potheads form a convenient means of opening the circuit for test or other purpose.



It should be stated that this type of construction is not expected to supplant entirely the use of overhead construction, and local conditions will govern the decision in making a choice between the two types.

Under conditions favorable to the installation of the cable the capital cost per mile will be less than for an overhead line. This applies to single phase circuits only, where in general the lead sheath is used as the grounded conductor of the circuit. Excepting under conditions extremely unfavorable to overhead construction the cost of laying 3-phase circuits underground will exceed the cost of similar circuit overhead.

It is expected however, that the cost of maintenance and operation and the rate of depreciation will be decidedly in favor of the underground system.

The underground system is proving very popular by reason of the elimination of unsightly wood pole lines from the highways, the avoidance of the necessity of cutting shade trees and the satisfactory operation during storms when overhead lines may occasionally be out of commission for considerable periods.

Catalog of Electric Hoists

The Link-Belt Company of Chicago and Philadelphia has recently issued a very comprehensive and instructive book on "Electric Hoists and Overhead Cranes." It is not only profusely illustrated with photographs of actual installations showing some of the most recent link-belt electric hoist applications, but with line and wash drawings, the subject of proper installation and efficient operation is fully covered. Going further than the usual "catalog," this new book tells in print and picture, of the practices and methods employed by users in widely divergent fields. For instance, the practices of a sewer contractor in Maryland, who uses a hoist for removing dirt, and the methods employed at a shipbuilding plant in Texas who employed the same means for moving and placing timbers, is illustrative of the wide range of activities covered.

Earth Road Maintenance Methods

The Heavy Blade Grader is the Most Useful Machine for the Care of Earth Roads—Classes of Grading Work and a Comparison of Various Systems of Dragging

By W. H. ROOT

Before the American Road Builders' Association

I think that I can state without the least reservation that the most useful and indispensable tool for the care of earth roads is the heavy blade grader. By this I mean a grader with a blade length of from 12′ to 16′, built heavy enough to do work that will require 30 to 50 drawbar horsepower. A blade of this sort is adapted to various kinds of work. The three main classes of blade work are.

1. Heavy blade work on roads which have never been built, that is, widening out and building to standard cross-section trails which have never really merited the name "road."
2. Finishing work on new construction.
3. Surface smoothing operations supplementary to regular patrol work.

I will try now to show you how this work is carried on in Iowa and at the conclusion of the paper I will show a few slides of some of the work we have done. It was in 1913, I believe, that the first 12′ blade machine was shipped into the state of Iowa. Now there are at least 400 of these machines in the state. In our early blade grader work we erred in not doing a thorough enough job. We paid little attention to getting the fences back to the line and clearing the right of ways. We merely shaped up the road as we found it. From 5 to 10 round trips were made and the total cost per mile was only $50 to $75. Each year, however, we have attempted to do more work and get a better road. We now require the fences and telephone poles to be moved back to the highway line before we start work. All trees, stumps and boulders are then cleared from the right of way. This work alone in some parts of the state, runs as high as $200 or $300 per mile. All heavy growths are also cut and raked up and burned. After the right of way has thus been cleared we are ready to start the blade work proper. The ditch line is staked out (18′ each side of the centre line) with lath. Enough lath are used so that two laths are always visible to the grader operator.

Each mile of road is a problem in itself. An ingenious grader operator will save lots of time and money by cutting down the number of round trips necessary. High side banks, narrow fills off centre, and wet ditches are only a few of the things that make a first class blade grader job difficult and expensive. We much prefer a blade grader with a back sloper attachment, that is, an attachment which may be bolted on the end of the blade so that the ditch bottom and back slope may be cut at the same time as the inside slope. A properly designed back sloper will cut the standard ditch and back slope when the main blade is cutting the standard inside slope. The back sloper should be adjustable so that the back slope can be flattened from 1½ to 1, to 2 or 2½ to 1 where dirt is needed.

Single Grader Preferred

On an average road we now make from 10 to 15 round trips with a single grader. Some counties still pull two 12′ graders with one tractor but I do not believe that this is economical. Where this practice prevails one grader of necessity must lie idle much of the time and the turning is more difficult. The average cost of our blade work including clearing, is about $150 per mile. However, we often have miles which run as high as $500 or $600 per mile. You would be surprised at the extensive work which is accomplished by some counties with the 12′ blade. We have built side hill roads in hilly counties where the material was mostly loose rock, and have had excellent results. Work of this sort when finished looks much more like permanent grading than it does like blade grader work.

No two miles of road require the same treatment, and the cost of blading, therefore, varies greatly. The following figures, however, roughly represent the cost of the average mile:

1 engineer, 25 hrs. at 75 cents	$18.75
1 grader operator, 25 hrs. at 60 cents	15.00
125 gallons of gas at 22 cents	27.50
Oil and grease	3.00
Depreciation on a $6,000 investment figuring a 3 year life of 100 working days per year—2½ days at $20 per day	50.00
Estimated repair 2½ days at $5	12.50
Interest on investment (5% on $3,000) 2½ days at $1.50	3.75
Clearing right-of-way and incidentals	19.50
Total	$150.00

Finishing Permanent Grading

The second class of blade grader work as outlined above, is the finishing of permanent grading. By permanent grading, I mean building a road to an established grade line which is presumably a permanent one. In grading operations in Iowa most of the dirt is moved with elevating graders and dump wagons. We insist on a Mormon scraper being kept constantly at work on the dump but the best job that can be done in this way is necessarily rough. Therefore, we require every grading contractor to have a 12′ blade grader in his equipment. This grader is pulled by a large engine and the road finished smooth close behind the rough grading. Often the same tractor that pulls the elevator, is used evenings and at odd times to smooth up the work.

We also find that all new grading settles unequally after a few rains. The shoulders usually become low and ragged, the ditches start to fill, and the back slopes sluff. It then becomes necessary to again blade the job. This last blading is done by the county as a maintenance measure. The back sloper is used. It fits into the ditch and back slope and builds the shoulder up in a uniform manner. The result is a workmanlike job, without perceptible waves and the cost is only $50 or $75 per mile.

The slogan of the National Paint Manufacturing Association "Save The Surface And You Save All" might be studied to advantage by State maintenance departments. The public judges a road by its surface. A road is good or bad, according as it is smooth and comfortable to ride over at 35 miles an hour, or as it is rough and inconvenient to travel at that speed. The user of the road cares little for clean ditches and nicely lined shoulders, if the surface is [illegible] This suggests the third and most appreciated class of heavy blade work. We have the patrol system of maintenance in our state but on practically all earth roads on the primary system, we find supplementary maintenance with a heavy machine very necessary. For this work we again prefer the heavy 12′ blade grader. In a number of cases we have lengthened these blades to 16′ or 18′ in order to cover the road surface in one round trip. Often we are able to pick up old graders which have become worn and loose jointed. These old machines can be bought for a song. We equip them with extension blades, put on heavy springs between the frame and the blade, to take up the play, and thus obtain an ideal maintenance machine.

Maintaining a Heavy Soil Road

The most difficult maintenance problem that we have is presented by a heavy soil road with heavy traffic, say a dense yellow clay road carrying 1,000 vehicles a day in all kinds of weather. It is obvious that before such a road has a chance to dry out so that it can be dragged, it has been hammered down until it is about as hard as a concrete pavement. However, the riding qualities are not at all similar to those of a concrete pavement. It is rough and rutted and anything but a pleasure to travel over. It is also absolutely beyond the control of any light equipped patrolman. Nothing but a heavy blade will ever put such a road back in satisfactory shape for travel.

This I believe, covers the field of the heavy blade grader. The road drag is also a widely used tool in our state but its work is not so readily classified. We have almost as many different kinds of drags and maintainers as we have operators. We have everything from 2 bladed drags weighing around 200 pounds and easily pulled by 2 horses to big heavy maintainers weighing 1 ton or more and pulled by 20 or 25 horsepower tractors. I do not expect to enter into a discussion concerning the relative value of these different machines, suffice to say that they most all have their good points. In my opinion the man not the machine, is the important factor. I would rather have a live ingenious man with good sense equipped with an old fashioned split log King drag than a "dumb-bell" with the fanciest maintainer manufactured.

System Divided Into Patrol Sections

We divide our earth roads into patrol sections of about 10 miles each. A patrolman is placed in complete charge of each section and he is held responsible for its care. He is usually equipped with a patrol grader, a drag, a slip scraper, a plow, and a set of small tools. He also has access to other equipment such as wheel scrapers, mowers, etc. He furnishes one team all of the time and in most cases has a second team which can be procured when needed. On the heavy soils we have to use four horses even on a small patrol grader. The patrolman's first duty is to keep the surface of the road smooth. To do this he must drag or see that the dragging is done, on his entire section as soon as possible after each rain. On light soils the dragging can be started after a few hours of sunshine following a rain and the equipment may be either a light patrol grader or a drag. A patrolman on this class of soil can care for his section with not more than one extra dragger. On heavy soils it takes much longer for the road to dry out sufficient to drag. Here the first dragging may be done by the patrolman but he will need 3 or 4 extra draggers. Often on this class of road the first dragging is done with heavy equipment.

The Iowa earth road maintenance policy and activities might be briefly summarized as follows:

1. Realizing that we will have to depend upon earth roads on a large part of our primary system for a number of years to come, we believe that we are justified in an intensive maintenance program on these roads, in order to give the travelling public service while they wait for our construction program to eliminate the mud.
2. As a first step in this program we have graded with the heavy blade grader, practically every mile of primary road that has not been otherwise constructed.
3. For finishing grading which has been built with an elevating grader and dump wagon, the 12′ blade grader is a most useful tool.
4. The heavy blade is indispensable for surface smoothing especially on heavy soils.
5. Earth roads should be patroled and the patrol sections should not be over 10 miles in length.
6. All patrol and light drag work must be supplemented with heavy maintenance machines.

Our maintenance ideal is continuous, automatic care and definite, individual responsibility.

May 19 and 21—Meeting of the Canadian Section, A.W.W.A.

The Third annual meeting of the Canadian Section of the American Water Works Association will be held at the Prince Edward Hotel, Windsor, Ontario, on Saturday and Monday, May 19th and 21st. Arrangements have been made for delegates travelling to the Detroit convention of the parent association, in session from May 21st to 26th, whereby they may purchase standard certificates for reduced railway fares. The sectional meeting will be held at the Prince Edward Hotel.

The programme will appeal to the practical water works man and it is hoped that they will come prepared to take part in discussions. It is being arranged so that Canadian Members will be able to attend all sessions of the Section and still be in good time for the opening of the Convention in Detroit on Monday evening.

The following is the tentative programme:

Saturday, May 19th

9:00 a. m.	Registration.
10:00 a. m.	Report of committees. Fire hydrant nozzle threads.
11:00 a. m.	Filter plant operation.
12:30 p. m.	Luncheon in the ball room, Prince Edward Hotel, for members and visitors as guests of the Windsor Water Commission and the Walkerville Water Company, Limited.
2:30 p. m.	Election of officers.
3:30 p. m.	Stand-by units for pumping stations with costs of operation.

Monday, May 21st

10:30 a. m.	Mains and service installations and Superintendents' question box.
11:30 a. m.	Pumper vs. pumping station pressure for extinguishing fires.
2:00 p. m.	Motor trip.

The Story of a Man and His Business

How Seaman, Kent Co., Ltd., Have Built up a Gigantic Hardwood Flooring Trade Through Presistent Efforts and Aggresive Policies—Two and a Half Million Feet a Month is the Capacity Today

To conceive and create an organization of national scope and make it the largest industry of its kind in the British Empire— and all within the period of twenty years—reads more like a romance than an actual accomplishment. The man behind this great enterprise is Frank Kent, president of the Seaman, Kent Co., Limited, Toronto—another illustration of the utterance of Emerson that any great institution is but the lengthened shadow of some personality whose pluck and perseverance never let go.

At the back of this gigantic undertaking in the flooring field is one who has risen from the ranks and knows the process of wood production from the camp to the consumer. Mr. Kent spent several seasons in the bush, mills and factories getting first hand knowledge of operations and coming closely in contact with men and materials. He is practical and progressive and, in the face of many setbacks and difficulties has steadily persisted and won a foremost place as one of the forceful factors in national development.

The story of the inception and expansion of "Beaver Brand" flooring in popularity and demand is an equally entrancing one. To-day the capacity of the plants of the company is two and a half million feet a month and the investment in factories, equipment, yards, warehouses, limits, etc., represents over a million and a half dollars. The Seaman, Kent Co. is an aggressive organization and its esprit de corps and co-operation are most marked. These characteristics extend into every avenue of the business with the result that quality, merit, dependability, attractiveness and beauty are distinctive of every foot of the output of an organization which has made the name of Seaman, Kent synonymous with that of hardwood flooring, not only in all the provinces of the Dominion but even in foreign fields.

To describe the process of its manufacture, the many operations, the equipment installed, the facilities required, the selling and distribution systems and other details, would require more space than is available at this time. For the present a few figures must satisfy. The dry kiln equipment of the company accommodates 925,000 feet, and the cooling shed capacity is, approximately, 300,000 feet, so that there is dry and cooling accommodation available at any given time of 1,225,000 feet. There is a storage track capacity, for lumber ready for the kilns to the extent of 250,000 feet. The company have, therefore, on hand 1,500,000 feet of lumber constantly on kiln tracks.

Look After Finished Product

The Seaman, Kent Co. believe that quality tells and that every expenditure in the way of care of the finished material is amply justified. The building trade knows that lumber cannot be properly dried and treated in kilns doing custom work. To ensure lumber going to the machines in perfect condition, ample kiln capacity is essential right at the point of manufacture and the process must be supervised by men who are proficient in this particular line. Seaman, Kent Co. recently enlarged the cooling sheds at West Lorne, Ont., which plant, owing to the large number of orders, will shortly be running both night and day. The other factories of the company are located at Meaford and St. Agathe, Que., and there are modern warehouses in Toronto, Montreal, Winnipeg and Edmonton.

Rigid regulations provide for a thorough examination of every foot of hardwood flooring that goes from the mills. Selecting and grading are an exact science with the firm and the purchaser is assured that his completed floors will not run below the standard selected.

Much more might be said regarding the enterprise and development of the Seaman, Kent Co. who are enthusiastic exponents of publicity and have made known far and wide the attractiveness, durability, cleanliness and sanitation of hardwood flooring. The propaganda carried on by them has done much to banish the daily drudgery of household work and make inviting the interior of many a Canadian home. The work has also broadened the business of the average lumber dealer, extended the activities of contractors, improved the appearance of many edifices and generally placed structural art on a higher plane.

Mr. Frank Kent

From the forest to the polished floor in my lady's salon, banquet hall or assembly room is a story symbolic of the Seaman, Kent Co. Yet when all is told, it must be remembered that back of the institution there is the so-called human element which runs through the entire personal of the organization. Many heads of the departments have been for years in the service of the firm, and loyalty and devotion are qualities which tally in the widening and welfare of any business.

Company Built up by Initiative

The staff, which now consists of over three hundred, has been stimulated by the example of the president and general-manager. Mr. Kent's hobby is work and more work, and yet he is a man who is bigger than his business. His life has not run solely along one groove or been confined within shop or office walls. His sympathies and work are cosmopolitan in character and freely has he given of his time and talent to public, philanthropic and humanitarian enterprises. While through initiative and foresight Mr. Kent has built up a company, the largest of its kind under the British flag, he has demonstrated that he is a man of generous motives and wide sympathies. For several terms he was mayor of Meaford where he resided for many years until the company removed its head offices to Toronto in 1920 and became incorporated. He is a director of the West End Y.M.C.A. and chairman of the Boys Farm Committee of the Rotary Club.

At a recent meeting of the Wholesale Lumber Dealers' Association in Toronto, Mr. Kent gave a short review of the great work which he and others are helping to carry out among the under-priviliged boys of the city. A home is being conducted at Wilcox Lake, North Yonge St., to look after lads whom Judge Mott of the Juvenile Court considers worthy of being given a chance rather than sending these erring ones to prison or a detention home. Mr. Kent believes that the father should be a companion to his boy, should try to enter into his son's life, understand his aims and ambitions and spend considerable time with the lad. It pays in every way, not alone in morals but in manhood. Much more might be added but a few of the sign-posts of a successful career have already been pointed out.

A Small Start

Mr. Kent was born near Bowmanville just a year before Confederation and spent several years in Bruce County, after which he came to Toronto and became an apprentice in a furniture factory at the low wage of $2.50 per week. Less than twenty years ago in the upper flat of a factory on Northcote Ave., with only a hundred dollars borrowed capital, his real start was made in the flooring line. He would go out and sell the product in his spare time and during daylight hours see that it was turned out. Quality was his slogan and he gained the confidence of the consumers and built up surely but steadily a connection in the trade which has made possible the position held by the Seaman, Kent Co.

Soon after starting a factory in Meaford, which town afforded splendid water shipping facilities, the plant was destroyed by fire, entailing a loss of over $100,000. Characteristically, Mr. Kent did not sit down and bewail his fate but soon commenced rebuilding operations on a larger scale. From that period down to the present the business has shown a gratifying gain and to-day Seaman-Kent is recognized as a great Canadian institution, financed, managed and operated by Canadian capital, brains and brawn. It is an achievement outstanding in the industrial interests of the Dominion.

How Defects in Concrete May be Minimized

Many of the Faults of Concrete Buildings Are Due to Errors in Design—Some Factors Are Easily Overlooked – Trouble Caused by Expansion Joints and Corrosion of Steel

By H. D. LORING*

Many errors in the design of concrete buildings are not those that lead to collapse or even to cracks. The loss of labor and material due to wasteful designing or poor judgment in the selection of type of construction, loads, stresses, are real though unseen losses not less than such defects as are pointed out here.

Structural defects in reinforced concrete usually show as cracks; occasionally as disintegration without definite cracks, and less commonly as spalling or buckling. Such defects may be the result of accidents that cannot reasonably be foreseen but many of them can be prevented by proper design and precautions in construction. We are concerned here more particularly with those that can be corrected in the drafting room, and while most of those pointed out in this paper are not particularly unknown or obscure, it may be profitable to bring them again to the attention of designers.

Some Facts Easily Overlooked

Many structures are injured or rendered unsightly by cracks due to the applied loads for which they are supposedly designed. Pure blunders, we are of course not concerned with, but sometimes there are factors easily overlooked. Walls to retain earth or water are frequently designed as vertical cantilevers, and such walls seldom give trouble, when they are straight. When, however, two such walls are built at right angles to each other as a continuous structure, a wide crack is very apt to appear near the corner, because each wall bends, under the earth or water pressure, enough to cause rupture, even when considerable amounts of steel are bent around the corners. The rigidity of continuous floor construction is so well fixed in the minds of most building designers that they may not at first thought consider how comparatively limber a cantilever is, but recalling that a cantilever of uniform cross section under uniform load deflects 48 times as much as a similar fixed beam with the same span and load, will give one a measure of the deflection that may be expected in cantilever walls. The simplest and often the best preventive of such cracks is to design the walls as separate structures with a joint near the corners. Where liquids are to be retained, this is not practicable and the two walls may be connected by a curved or broken section of considerable radius with liberal horizontal reinforcements extending into each wall far enough to take care of stresses caused by restraint. For low walls a generous fillet in the corner with liberal horizontal reinforcement, may be sufficient.

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*Of the Ferro Concrete Construction Co., Cincinnati, O. Abstract of a paper read before the American Concrete Institute.

On walls subject to fluid pressure, the overturning moment varies as the cube of the height, and is 2.37 times as much on an 8-ft. wall as on a 6-ft. one. Although earth-retaining walls are usually designed for fluid pressure, skepticism of such alarming precision is probably justified in view of the uncertainty as to just how much pressure earth does exert on a wall. However, several years ago when we were advised that a small retaining wall which had been built five or six years, was buckling out of line, we found that the fill behind it had increased from about 6 ft. to about 8 ft. and was being supported by wooden flash boards held by posts behind the walls. Soaking rains had contributed to the overload which had been sufficient to throw the wall considerably out of line. In choosing factors of safety the possibility of overload from excessive surcharges may well be borne in mind.

Cinder Roof Fills

A frequent source of trouble in concrete buildings having the roof insulated with a fill of cinders is the buckling of the cement topping placed over this fill to receive the roofing. The topping usually is a thin slab of rather lean mortar and unable to withstand the compressive stresses due to expansion at summer temperature, which will frequently raise large blisters. The resulting ridge cracks are very destructive to roof coverings and are a frequent source of troublesome leaks. Expansion joints are easily made in the topping with some of the prepared strips of bituminous material sold for the purpose or by leaving wood strips which are removed and the space filled with mastic. Such joints should provide for expansion in all directions at the rate of at least ½ in. for every 50 ft.

Cinder fills often become saturated from rains before topping is laid and the water slowly finds the only way out—through the ceiling, resulting in dampness for many weeks or even months. The cost of fill and topping with the cost of carrying their weight to the foundations may amount to 15c or 20c per sq. ft. and at best they do not form as good a foundation for roofing as a solid slab. This leads to the inquiry as to whether they may not be eliminated altogether in many cases. Inasmuch as composition roofing contractors will usually guarantee a dead level roof as readily as a sloping one, filling is not a necessity for forming slopes when it is not desired to pitch the structural slab for this purpose. The best reason for the use of cinder fill is as an insulator to prevent undue condensation on a cold ceiling in winter and excessive heat in the top storey in summer. While cinder fills accomplish this result successfully and are desirable in buildings, with thin roof slabs in beam and slab construction, the greater thickness of structural concrete in flat slab construction is in many cases sufficient insulation in itself. We have examined several heated buildings constructed within the last year or two, where the roofing was applied directly to level structural slabs, and found them giving satisfaction. In one case, a portion of the building is used for office purposes with a plastered ceiling applied directly to the concrete and no condensation was noted or other trouble experienced by the occupants. The saving in the cost of roof fill is a considerable item in buildings where low first cost is imperative. In colder climates there is of course, more necessity for the fill as a heat saver.

Expansion Joints Give Trouble

While expansion joints in fill toppings are absolutely necessary to prevent trouble in even buildings of moderate size, expansion joints in the building itself are another matter. The question of expansion joints in concrete buildings has been a much discussed one and probably the present tendency is to use them in fewer buildings. We believe they are seldom needed in buildings up to 300 ft. in length. Where they are used, careful designing is necessary to prevent their giving trouble, especially from leaking floors, in buildings where wet operations are carried on.

Perhaps the best form of expansion joint is one in which the adjoining parts are independent cantilevers. Such a joint used in the Anheiser-Busch building at St. Louis, was described in the technical press a few years ago. In another building, 560 ft. long, it was considered advisable to use an expansion joint which was secured by resting the ends of the beams carrying one side on brackets formed on the girders and columns of the other, to form a sliding joint. In this case, however, the frictional resistance developed by the dead load of the construction was sufficient to spall or pull off some of the brackets, rather than to permit sliding. In designing such brackets, either for expansion joints or to carry future extensions, care should be taken that sliding on the joint will take place before any destructive force may be transmitted to the brackets.

In beams, cracks of the well-known shear variety may be caused by forces other than loading, for example, a slight settlement of supports, or of the form work before the concrete has fully set. These cracks are likely to occur as in shear failures, since the accumulated stresses are greatest at these points. Cracks of this kind can usually be avoided by placing stirrups throughout the beam, not further apart than three-quarters the effective depth, and repairs can be made by cutting out a section of the beam and floor, placing sufficient stirrups and re-concreting.

Exposed Structural Members

In many buildings having structural members exposed on the exterior, time and the elements have worked considerable damage, spalling and flaking of concrete and exposing steel to corrosion. Frequently the spalling is occasioned by the swelling of steel which has corroded when reached by moisture, due to insufficient covering; perhaps occasionally aided by electrolytic action. The great preventive of such unfortunate results is sufficient concrete protection for the steel. No such members should be designed with less than 2 in. minimum cover and 3 in. or 4 in. would often be desirable. Where bars are accidentally exposed during construction, the trouble should be remedied at the time. The dense surface finishes produced by rubbing in cement grout are a protection to the building as well as in an addition to its appearance, while the bush-hammered effects and other finishes which expose aggregate should be used only when ample cover is given to the steel. Repairs to buildings so damaged are difficult and costly, but should not be neglected. The steel should have all loose scale wire-brushed or otherwise removed before pointing is done and every precaution taken to secure a bond for the pointing mortar. Metal lath may sometimes be used to advantage by tying to the reinforcing with galvanized wire. Painting the steel with a bituminous coating before pointing with mortar may prevent further corrosion.

Some building codes encourage the placing of steel too near the surface by specifying that in vertically rodded columns only the concrete inside the ties may be counted to carry load. This appears to be based on an incorrect idea of the use of ties in vertically rodded columns; their function is, of course, only to stay the vertical bars and they cannot add anything to the strength of the concrete in the way that closely spaced spiral hooping does. Such test data as the writer has examined do not show any effect of changing the location of vertical steel in a column, as long as it is symmetrically disposed. In designing columns for bending moment, the position of steel must of course be taken into account.

There are many other points for the designer to bear in mind to facilitate the production of good concrete in the field, such as the proper location of construction joints, the reinforcement of re-entrant angles, the avoiding of sharp, thin sections and the design of sections and disposition of reinforcement that will permit concrete to flow into space readily. The skill of the organization doing the work has a bearing on permissible details. The speaker recalls a structure consisting mainly of 4-in. walls, 26 ft. high, which were poured in two lifts and showed hardly a flaw when the forms were removed. These walls had one layer of steel only, in the centre, but in some work 8-in. walls would be the thinnest that could be used with confidence of tight work.

The designer who bears in mind that concrete is a brittle, porous material, manufactured in molds and usually in continuous structures, will be likely to design structures which with reasonably good field work will not only have the requisite strength but are satisfactory in finish and as durable as we have a right to expect from the widely advertised "concrete for permanence."

Modern Developments in Methods of Maintaining Bituminous Pavements

Distributors and Methods of Spraying the Materials on the Road—Should Counties Do the Work or Should They Use Private Distributor Service? —Patching and Repairing

Bv B. C. TINEY
Assistant Maintenance Engineer, Michigan State Highways Department

Before the Michigan Conference on Highway Engineering

Bituminous materials are quite generally applied by motor pressure distributors of various types. The pressure is usually afforded directly by a pump, operated by a power take-off from the transmission of the truck or, in a few instances, by a separate power plant. A powerful truck motor is required if it is to assume the additional work of pump operation. The pump is so designed that it can be used for filling the distributor from tank cars as well as applying material to the road surface. A cut-out may be so arranged that the exhaust from the motor comes in contact with the pump, and by warming the material, increases fluidity and ease of pumping.

It is important that distributors be equipped with heating arrangements. Even though the material is brought to the required temperature in the tank cars, a long haul or other delay will often necessitate reheating on the road. Heating equipment may consist of oil-burners or steam coils. Steam is, in one type of distributor, generated by a small boiler on the rear of the truck, but it is more commonly supplied from an outside source, which is not always conveniently located. The advantage of a self-contained source of heat is obvious as it permits of heating during a long haul so that the material arrives on the road ready for application.

Spraying manifolds are so designed that any width of treatment from 2 to 16 feet may be applied, but common practice confines the application to about 8 feet or half the width of roadway, at one time, as this enables traffic to avoid the freshly laid material.

Distributors should be equipped with a thermometer, pressure gauge, and speedometer. The tank should be calibrated in order that the correct gallonage may be charged to each road. The rate of application is varied by setting of valves and by the speed of the truck. A table showing the quantities applied per square yard for different valve settings and truck speeds should be posted in the cab for the use of the operator.

Using Service Furnished by Private Companies

Until recently, the distributor service afforded by the bituminous materials companies has been largely employed by counties in this state. This service, while very commendable in some respects, had certain draw-backs. Many counties required service at the same time and the companies found it difficult to arrange a schedule which would give every road a treatment at the proper time. A macadam road, upon which a necessary treatment is deferred, soon begins to ravel and requires hand patching.

The work, being widely scattered, required that distributors be moved long distances at considerable expense. The labor gangs employed by the companies to prepare surfaces and spread stone covering were compelled to remain idle at times, due to unfavorable weather conditions or delay in shipment of materials, and this increased the overhead cost to the companies.

It was believed that conditions might be bettered and the work placed upon a more economic basis if performed directly by use of county forces and equipment. With this in view, five counties purchased distributors in 1922. These machines were mounted on army trucks furnished through the state highway department at a nominal cost.

The plan has, in all cases, proven very satisfactory. The quality of work performed has been excellent, and a material saving in cost has been effected. An analysis of costs in one of these counties for the season of 1922 is as follows: Twenty-four roads, aggregating 408,000 square yards, were treated with 135,000 gallons of tar, averaging a little less than 1/3 gallon per square yard. Tar cost 9.4 cents per gallon f.o.b. county in tank cars. Slag cover, costing $2.25 to $2.50 per ton f.o.b. cars in county was distributed in piles by motor trucks. Labor was 35 cents per hour.

Averaged Itemized Cost per Square Yard

Slag, in piles along road	$0.016
Preparing surface and spreading slag	0.008
Tar f.o.b. railroad siding	0.031
Application of tar	0.005
Gasoline, oil and overhead	0.006
Total cost per square yard	$0.066

A portion of this material was applied hot. The costs given include a rental charge on equipment used.

The contract price in this county in 1921 for a treatment of 1/3 gallon per square yard was $0.113. On this basis we have a saving of $0.047 per square yard on 408,000 square yards, or approximately $19,000. About $4,000 of this amount is due to a reduction in the price of tar, leaving a saving of $15,000 which is chargeable to the performance of work by use of county forces and equipment.

Storage Facilities Would Reduce Cost

Similar results have been the experience of other counties operating their own distributors, and it is believed that this plan will come into more general use. The installation of permanent tanks for storage of bituminous materials would add to the efficiency of the system. Demurrage and tank-car rental, which amount to considerable sums if winter conditions are unfavorable, would be practically eliminated. The shipment of material is liable to be at best an erratic proposition. Storage facilities would tend to co-ordinate shipment with application of material, enabling the work of distribution to proceed more steadily.

It is often possible to install storage tanks at such elevation as to permit of unloading from tank cars by gravity. Tanks should be of sufficient size to hold one carload (approximately 10,000 gallons) of material, and should be equipped with steam coils or other arrangements for heating.

In addition to regular surface treatments at intervals of from one to three years, depending upon the amount of traffic, it is necessary that bituminous macadam surfaces be patrolled frequently and small holes patched soon after they appear. The importance of this feature of the work is usually underrated, but it is one of the answers to successful maintenance. Shallow breaks in the surface crust may be swept clean, given a brush coat of bituminous surfacing material and covered with a layer of stone chips. A brush coat is preferable to a poured treatment as it avoids an excess of material, which is very undesirable. The practice of patching holes greater than 1/2 to 3/4 inches in depth by pouring partly full of a cold bituminous surfacing material and covering with an excess of chips has been quite common and is to be discouraged. It is obvious that such patches will remain unstable for some time and a large percent of them will be displaced by traffic. Patrol maintenance on shallow patches may be conveniently handled by storing bituminous surfacing material in barrels sunk in the ground at intervals along the road. These barrels are provided with covers and are readily filled by a hose from the distributor tank. Piles of stone chips are also stored at necessary intervals. A patrolman equipped with a wheelbarrow, bucket, broom and shovel is enabled to patrol a maintenance section very efficiently.

Cold Patch Repairs

Holes of an inch or more in depth may be conveniently repaired by the cold patch method, being tamped full of a cold mixture or aggregate with cut-back tar or asphalt, which depends for its setting-up qualities, upon the evaporation of volatile oils. The stone for this mixture may range in size from 1/4 to 3/4 of an inch, fractured shapes being preferable to rounded pebbles. The quality of the aggregate is a large factor in the success of any bituminous mixture, and it is often found to be economy to ship in a hard tough stone at additional cost, rather than use a cheaper local material of inferior quality.

The mixture should be made in the proportion of 16 or 18 gallons of bituminous material to a cubic yard of stone. A small amount of coarse sand may be added, but is not essential to good results. An excess of either sand or bituminous material will tend to make the patch unstable.

It is found that the patches offer more resistance to displacement by traffic if the mixture is allowed to cure for a few days before placing in the road, and also, in case of the deeper holes, if a larger stone is used in the bottom layer of the patch, being surfaced with the finer mixture. The hole to be patched should be swept clean and painted lightly with bituminous material before tamping in the mixture. A light sanding of the surface prevents adhesion to traffic while curing.

Where considerable quantities of cold-patch are used, the mixing is most efficiently performed by means of a small concrete mixer. This may be housed in a building of sufficient size to provide space for mixing and storage of materials. The design of the building should be such that a motor-truck may be driven into it and at least a part of the materials handled mechanically.

A number of such mixing stations, placed at central locations for given maintenance sections, could be constructed on standard plans, so that one mixer could be readily moved by truck and made to do service for all stations. In this way a supply of mixture might be kept on hand and curing at each station.

A hundred miles of bituminous surfaced road, for example, might be divided into four 25 mile sections, each having a central mixing station so that the average haul of mixed material would be only 6 or 7 miles. This condition would, of course be ideal, the work being, in general, more scattered, but it is believed that in most cases a satisfactory arrangement could be worked out.

The Repairing of Large Breaks

Extensive replacements of bituminous surfaces are often made with bituminous macadam by the penetration method. Two sections of a certain trunkline of this state have, within the past four years furnished notable examples of road failures. They were quite widely separated but had many characteristics in common, the construction of both being a Topeka surface on a cement-concrete base. The failures were caused by a combination of heavy traffic, poorly-drained sub-grade, and insufficient thickness of base. The maintenance of these roads presented a difficult problem. Both were main arteries carrying an average daily traffic of 2,500 to 4,000 vehicles, many of which were heavily loaded trucks, and it was imperative that extensive replacements be made with as little inconvenience to traffic as possible.

This consideration led to the choice of bituminous macadam for replacement, as these patches could be placed under traffic almost as soon as they were finished. The general method of procedure was to remove sections of the broken pavement and the subgrade to a depth of at least eleven inches below finished grade, or deeper if necessary to obtain a firm foundation for the new work. It was often found necessary to go to a depth of eighteen to twenty-four inches. The lower portion of the patch was constructed of macadam in four-inch layers, compacted by a roller, if the patch was large enough to permit a roller to work, otherwise being hand-tamped. In the case of some of the larger patches, the upper layer of this macadam base was water-bound, but in most instances it was merely dry-filled with screenings. The surface course of bituminous macadam was then placed to such height that it rolled down flush with the finished grade of the old pavement.

This work is rather expensive, costing from $5.00 to $7.00 per square yard, but the conditions were abnormal and any type of replacement would have been very costly. Had it been possible to have closed the roads to traffic, a saving of at least 25 per cent would have been effected. It is thought that these roads may, ultimately, be rebuilt with a heavy macadam base and a high-type surface, in which event many of the large patches will have a salvage value. In fact, 4 1/2 miles of one section has been re-constructed, using a 3-course water-bound macadam, 12 to 15 inches thick, which is at present carrying traffic on a surface treatment. The idea in this case is to let the macadam season under traffic for a time before placing a high-type surface.

Where Asphalt Plant is not Available

The maintenance of asphaltic concrete or sheet asphalt surfaces in locations where an asphalt plant is not accessible is often carried on by the use of small portable plants wherein the asphalt and aggregate are heated in separate compartments and the mixing is done by hand. A gang of four men using one of these plants can mix and lay from 30 to 60 square yards of surface daily. A roller is not required on these small patches as they may be compressed by hand-tamping with hot irons.

In relieving ruts and depressions in an old asphaltic pavement by the addition of fresh mixture, the new material may be bonded to the old by first softening the latter with a surface heater. The heat is applied by oil-burners and confined to the pavement by a hood. Care must be taken to avoid burning the old material, although no flame comes in contact with it.

Old material taken from an asphaltic pavement may sometimes be re-heated and used again. This plan is used a great deal in the winter maintenance of asphaltic streets in the city of Cincinnati. The old pavement is broken into pieces about 2 1/2 inches in size and placed in four-wheeled kettles of 100 gallons capacity. About 4 or 5 gallons of water are added, the kettle is covered and the mixture allowed to steam for about one-half hour. The material is then turned over with heavy bars, and spaded. Allowing time to steam, the mixture is turned and spaded several times until the water is all evaporated and the temperature raised to about 325 deg. F. The kettles are then hauled to the street and the mixture tamped into the holes.

Prior to 1922, the bituminous materials used for maintenance of state and county roads in Michigan were purchased individually by counties under the trade names of the various producers. The state highway department, in participating in the cost of trunk line maintenance, found but little uniformity in the price or quality of materials used for the same purpose in different countries.

In 1922 the state introduced the idea of centralized purchase of these materials, on standard specifications. Acting in behalf of counties, the state received competitive bids on estimated quantities. A tabulation of all bids was sent to each county, together with recommendations as to choice of materials. The counties then executed contracts on standard forms furnished by the department. Arrangements were made for laboratory control of the materials by the state highway testing laboratory. This plan resulted in a material reduction in price, more uniform quality of materials and better service. The state and counties are unanimous in their desire to continue this arrangement, with a few minor changes in 1923.

National Cement Co. Plan 2,000 bbl. Plant

Preparations are under way, it is reported, for the construction of a 2,000 barrel per day portland cement plant for the National Cement Co. Ltd., a company that was incorporated last January under the laws of the province of Quebec, with the following as promoters: J. Versailles, of Versailles, Vidicaire and Boulais, bankers and brokers, of Montreal; Edward Cote, piano manufacturer, Fall River, Mass.; Israel Laplant, Fall River, Mass.; Manuel Silva, Fall River, Mass.; I. Bernard, Boston, Mass.;and E. A. Ouimet, of Credit, Canada, Ltd. The company, which supplants the Hochelaga Cement Co., incorporated in February, 1922, has purchased a block of 115 acres of land located at Montreal, East. The site is said to carry a very large quantity of limestone, suitable for the manufacture of portland cement and is excellently situated with respect to transportation facilities by water, rail and tramways. The company's organization has not been fully completed, but it is expected that construction work will soon commence.

Edward Cote, of Fall River, Mass., will, according to reports, assume the general management of the company. Richard V. Meade, of Baltimore, is the consulting engineer, while Mr. Louis Hurtubise is the engineer at Montreal.

With regard to the financial arrangements, it is reported that of the $1,500,000 of preferred stock, $1,000,000 has been underwritten and $400,000 paid up. This money is being used to finance preliminary investigation work and to buy machinery. A bond issue of $1,500,000 has been authorized and is to be placed on the market in the early fall by Credit Canada, Ltd., Montreal. The proceeds will be used to conduct operations.

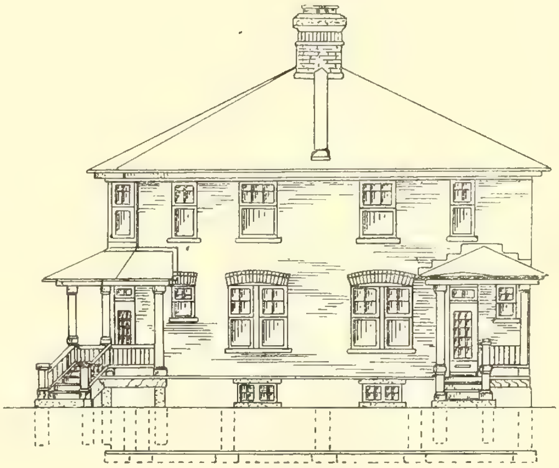
The Contract Record's

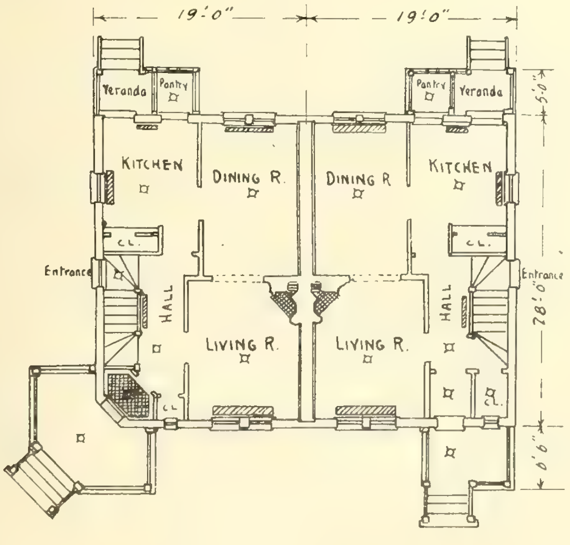
Weekly House Suggestion No. 65

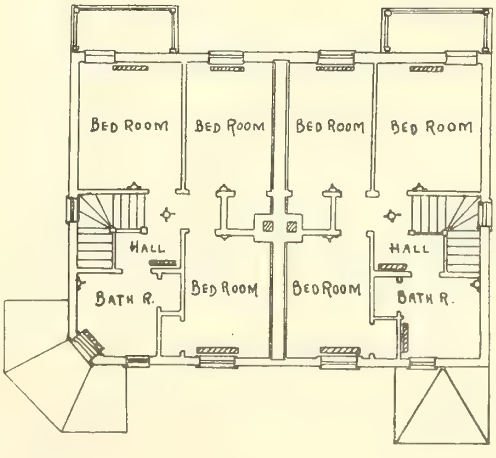
We are showing this week another example of the duplex type of residence, designed by Mr. Alfred Potvin, architect, of Montreal, and erected in that city recently. The duplex house has gained great popularity within the past few years and more particularly in Montreal and district, due mainly to its economy in construction, and the subject we show in the accompanying illustration indicates the progress that has been made in the designing of this type of house to secure the utmost in convenience and appearance. This house was constructed at a cost of $8,800.

The construction is of wood and brick, the foundations of concrete and the roofing, asbestos shingles. All interior woodwork is of pine and the flooring throughout is of hardwood. Both residences are provided with three good-sized rooms and entrance hall on the ground floor and both living rooms are equipped with fireplace. The centre wall dividing the two residence is of concrete block construction.

The upper floor, in each case, has three bedrooms and bathroom conveniently laid out and well equipped with closet space. The heating system is of the hot water type.







Mainly Constructional

East and West—From Coast to Coast

Messrs. D. G. Loomis & Son, Montreal, have moved their offices from the McGill Building to 1112 St. Patrick St.

The bill to incorporate the Buffalo and Fort Erie Public Bridge Company was put through committee and given its third reading in the House of Commons a few days ago.

More than 200 men will be employed in the construction of the $1,000,000 elevator which the Carter-Halls-Aldinger Company, Contractors, Winnipeg, are building at Port Arthur, Ont., for the N. Bawlf Terminal Elevator Company. Work on the superstructure has been started.

A meeting of several representatives from various places in eastern Ontario, at Kingston, recently passed a resolution to form the Rideau Lakes Development Association.

Fire losses in Canada during the week ended April 11, are estimated by the Monetary Times at $404,300, compared with $501,449 for the same week last year.

Members of the London, Ont., branch of the Engineering Institute of Canada are offering their services to the people of that city in an effort to solve the fuel problem. Following a meeting of the institute recently a committee of four was appointed to map out a programme by which the members could best serve the community in this respect. It is intended to investigate all phases of the situation, including the use of every fuel excepting anthracite. Efforts are to be made to find some new field for fuel, so that Canada will not be forced to depend on the mines of Pennsylvania. The possibility of bringing coal from Alberta is also to be thoroughly sifted.

A recent announcement states that Sir Henry Thornton has informed civic officials at Bridgeburg, Ont., that the C.N.R. cannot undertake at the present time to re-construct the international bridge at this point.

The Ontario Public Works Department is calling tenders for the erection of a memorial hall at the Ontario Agricultural College, Guelph, Ont. This project was proposed shortly after the end of the war, but was temporarily abandoned. It looks now, however, as if a start will be made shortly on this structure.

A recent statement from Ottawa is to the effect that wage problems in that city have been settled in several of the different branches of the building trades. Bricklayers are to receive $1 an hour this year, which means an advance of 15 cents an hour over the rate in the 1922 agreements. The carpenters also are to receive an increase of five cents an hour over last year's rate bringing their wages up to 75 cents an hour, and members of the laborers union are to receive 45 cents an hour. The contractors expect that stonemasons will will sign an agreement at the same rate as the bricklayers. Plumbers signed last June for a period of two years.

The secretary of the Toronto Builders' Exchange announced recently that the Carpenters' Section of the Exchange has fixed the rate of wages to be paid to that class of labor during the present year at 90 cents an hour, which is an increase over the existing rate. The carpenters have been demanding $1.00 an hour and have not, as yet accepted the proposed new rate. The new wage is to go into effect on May 1. The question of wages and working conditions for stone cutters and hoisting engineers is under consideration by the sections interested and a decision will be announced at an early date.

The announcement that a branch railway line is to be constructed from Swastika to the Crown Reserve Mine, in the Kirkland Lake district, Northern Ontario, was received with great jubilation by the mine owners of the district recently.

A deputation waited on Premier Taschereau, of Quebec, recently, asking for a grant for a bridge to connect the provinces of Ontario and Quebec over the Ottawa River at Hawkesbury. A recent report states that Premier Drury of Ontario will also be approached on the matter shortly. It is proposed that the cost of the structure be evenly divided between the two provinces.

There is a persistent rumor in the Toronto district that the Canadian National Railways will erect a skyscraper office-building on the corner of King and Yonge Streets, that city. A recent item states that this project was discussed by the directors of the company at a meeting held a few days ago and, although no definite statement has been made regarding plans for the new structure, a report from the meeting is to the effect that the project will be given close attention immediately.

City Engineer Near, of London, Ont., has suggested the replacement of the existing Ridout St. bridge, in that city, in the interest of safety. Former city engineer Brazier declared this bridge unsafe for traffic two years ago and recently there was a slight collapse of one portion, under a heavily loaded street car.

It has been reported that all the plans for Canada's participation in the British Empire Exhibition to be held in London, Eng, from April 20th to October 31st, next year, are practically completed. The Dominion government will erect its own building—an imposing structure in Neo-Grec architecture—on a commanding site in Wembley Park, where the Exhibition is to be held. The building will be 415 feet long and 300 feet wide, with a floor space of 124,500 square feet. The exhibit is to be financed, controlled and directed by the federal government. The estimated cost is $1,000,000. On the same site as the Canadian government building will be two additional separate buildings, to be built by the two transcontinental railways, each with a floor space of approximately 10,000 feet.

Personal

James T. Coltham, a well-known Ontario Land surveyor has been appointed by the Ontario government to explore lakes and rivers on the slopes of Hudson Bay. Mr. Coltham is a graduate of Toronto University and it was under his direction that many of the roads and bridges of North York were constructed.

Mr. H. M. Fries, foreman of the Ebsary Fireproofing & Gypsum Block Co. Ltd., of Scottsville, New York, has been appointed manager of this company's plant at Caledonia, Ont., succeeding Mr. J. Strable.

Mr. D. R. Brockbank, waterworks superintendent of Paris, Ont., for the past twenty-five years, has recently been appointed Hydro superintendent, in addition to his present position, succeeding G. W. Wheeler, resigned. Mr. Brockbank has seen many changes in Paris during his many years with the waterworks department, first from the old single stroke steam pump to the duplex, then to the triplex plunger electrically operated, and finally in 1914 when Hydro appeared on the scene, two centrifugal pumps—Mather Platt and Canadian Allis-Chalmers—were installed, bringing the plant quite up-to-date.

Obituary

Mr. Frederick T. G. Wilson, building contractor of Stouffville, Ont., died suddenly from heart disease, while aboard a train travelling from Toronto to his home. Mr. Wilson was 67 years of age.

CONSTRUCTIONAL ACTIVITY

Period of April 18 to April 24, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Amazon, Sask.
Tenders are wanted by the Procincial Government until May 2 for roadwork from Amazon to Watrous. Plans at the Dept. of Highways, Regina.

Caledonia Twp., Ont.
Tenders are being received until May 12 for a drain. W. H. Magwood, Cornwall, engineer.

Campbellton, N. B.
Tenders for 36,000 sq. yds. of hot mixed paving are being received by R. J. Sanoversly, engineer, until May 7.

Charlottetown, P. E. I.
Tenders for grading and concrete structures for the province of Prince Edward Island are being received until May 11 by L. B. McMillan, Parliament Buildings, Charlottetown as follows: 42-West Devon to West Point; 48-Grapaud to Brookfield; 50-Rocky Point to Long Creek; 52-Fort Augustus to Pisquid; 54-Vernon River to Grand View; 56-Kinross to Montague; 58-Murray River to Murray Harbor North; 60-Irishtown Road from Brytentons Corner to Park Corner.

Chatham, Ont.
L. A. Pardo, Chatham, is receiving tenders until May 4 on 9 concrete and steel bridges and culverts for Kent County. One bridge has a span of 70 ft. while others range from 8 to 16 ft. W. G. McGeorge, 153 Queen St., engineer.

Delisle, Que.
About June 1 Town Council contemplates a sewer and gravelling a road at a cost of $30,000. P. E. Trembly, secretary.

Dereham Twp., Ont.
The Council is receiving tenders on a drainage system until May 14. Frank Small, Mount Elgin, clerk.

Eastview, Ont.
Waterworks contemplated by the Town Council will cost $22,000. J. Wolfe, Cummings Bridge, engineer.

Elmvale, Ont.
C. S. Burton, Flos Township Clerk, is receiving tenders for draining Pheipston Marsh Draw in Flos Township at a cost of $12,000. J. J. Newman, Davis Block, Windsor, is the engineer.

Etobicoke Twp., Ont.
The Township Council is receiving tenders on grading and reinforcing concrete bridges until May 7. James Proctor & Redfern. 36 Toronto St., Toronto, engineers.

Glace Bay, N. S.
Work will commence shortly on an $80,000 pavement and street for the Town. Neil McNeil, Town Clerk.

Tenders will be called shortly for repairs to the reservoir and main extensions at a cost of $17,000.

Tenders for sewers costing $17,000 will be called shortly by the Town Council. L. Shanahan, engineer.

Hanover, Ont.
Separate or combined tenders for the construction of a pump-house, concrete reservoir and laying of watermains together with waterworks appurtenances are invited by the Town of Hanover. J. Taylor, clerk. F. W. Thorold & Co. Ltd., 54 Admiral Rd., Toronto, Consulting Engineers.

Iberville, Que.
Prices wanted on waterworks supplies by Oscar Beaudoin, 71a James St., Montreal, include hydrants, valves and cast iron specials.

Kinloss Twp., Ont.
Kinloss & Huron Townships Councils, have had plans prepared for a drain costing $2,000. E. D. Bolton, engineer, Listowel, Ont.

Ottawa, Ont.
City Council has passed a report for the laying of 8,000 yds. of asphalt at a cost of $16,000.

Pavements contemplated by the City Council will cost $183,000. Work is expected to proceed in June.

Tenders are to be called shortly by the City for pavements on Carling Ave. between Fairmont and Parkdale Aves. and Sunset Blvd. from Bronson to Driveway. Tenders will close on May 1. Work is estimated to cost $20,000.

Port Dalhousie, Ont.
The Town Council is receiving tenders until May 1 for sewers. Plans and specifications are with the Town Clerk.

Quebec, Que.
The Provincial Government, L. J. Boulanger, Deputy Minister of Highways, is receiving tenders on the following roadwork until May 3: Levis-Jackman, Beauceville, town, bituminous macadam, 1.74 miles; St. Bruno-Roberval-St. Bruno, Roberval, town, bituminous macadam, 3.29 miles, Roberval, parish, gravel, 8.62 miles; Levis-Rimouski, Warwick, village, macadam, 1.61 miles, Arthabaska, town, macadam, 2.05 miles; Richmond-Yamaska, Grantham Twp., gravel, 3.06 miles, St. Germain-de-Grantham, 5.25 miles, St. Edmond-de-Grantham, 0.34 miles; St. Hyacinthe-Drummondville, St. Germain-de-Grantham, gravel, 0.94 miles; Drummondville-Annaville, St. Cyrille-de-Wendover, gravel, 1.17 miles, Wendover-Simpson, 4.00 miles; Montreal-Toronto, Vaudreuil, parish, macadam, 3.68 miles; Iberville-St. Albans, St. Sebastien, parish, macadam, 3.78 miles, St. Athanase, parish, macadam, 1.89 miles, St. Georges-D'Henryville, macadam, 2.10 miles; Lacolle-Knowlton, Dunham Twp., gravel, 4.76 miles, Dunham, village, 0.49 miles, Cowansville, village, 0.89 miles, Sweetsburg, village, 1.47 miles; Montreal-Hull, St. Scholastique, parish, oiled macadam, 0.81 miles; Caughnawaga-Malone, Elgin Twp., macadam, 0.71 miles, Laprairie-Lacolle, St. Jean, county, macadam, 0.77 miles.

St. Lambert, Que.
City Council intends to lay asphalt pavements on the following streets: First Ave. from Stanley to Hickson Sts. to Edison & Union Sts.; Second & Third Sts. from Hickson to Union St.; Mercelle Ave. from Green to Lesperance St.; Riverdale Ave. from Sanford to Merton St.; St. James St. from Edward to Petit Bois Rd.; Sanford St. from Riverside to River St.; Pine Ave. from Riverside to River St. Oak Ave. from Lesperance to Mercier St.; Maple Ave. from Logan to Green St. City Engineer, E. Drinkwater.

Three Rivers, Ont.
Macadam road on St. Marguerite St., contemplated by the City, will cost $60.-000. Chas. Gelinas, engineer.

Whitby, Ont.
J. Kean, engineer for Ontario County, is receiving tenders until April 27 for the construction of concrete culverts, grading and hill cutting in Uxbridge and East Whitby Townships.

CONTRACTS AWARDED

Eston, Sask.
A. W. Heise Construction Co., Saskatoon, Sask., has the general contract for a sewerage disposal plant for the hospital at $5,000.

Lancaster, Ont.
The Township Council has awarded the general contract for crushed stone and gravel for about three miles of roadway in Lancaster Township, 4th concession, to Neil McDonald, Dalhousie Station, Que.

Levis, Que.
Ulderic Paris, Deschaillons Co., Lotbiniere, has the general contract for a macadam road for the Provincial Government at a cost of $13,000.

Moncton, N. B.
Sidewalks costing $15,000 contemplated by the City Council. The contract for 5,900 bags of cement has been awarded to Sumner Co., 635 Main St.

Railroads, Bridges and Wharves

Aubert Gallion, Que.
The secretary is receiving tenders on a steel bridge. I. E. Vallee, Dept. Public Works, Quebec, engineer.

Dereham Centre, Ont.
Road Superintendent, J. D. Flanders, is receiving tenders until May 14 for four bridges one 28′ span, one 40′ span, one

18′ span and one 25′ skew span, for the Township of Dereham.

Elma Twp., Ont.
Tenders for a steel and concrete bridge costing $25,000 are being received by the Council until May 5. E. D. Bolton, Listowel engineer.

Hamilton, Ont.
The Harbor Board and the City Council contemplate a revetment wall and a dock at the foot of Ottawa St. costing $400,000. Slip will be 2,000 ft. deep. Wm. Ainslee, Chairman of the Harbor Board, 47½ Main St. E.; S. H. Kent, City Clerk.

Louisville, Que.
Tenders will be called in June for repairs to a steel bridge over Riviere-du-Loup. I. E. Vallee, Parliament Buildings, Quebec, engineer.

Meaford, Ont.
Tenders will be called shortly by the Dominion Government for repairs to the docks costing $5,400. R. C. Desrochers, Parliament Buildings, Ottawa, secretary.

Midland, Ont.
Engineers of the Department of Public Works are preparing plans for repairs to wharves at a cost of $9,400. Tenders will be called shortly. R. C. Desrochers, Department of Public Works, Ottawa, secretary.

Renfrew, Ont.
Renfrew County Council will call for tenders about May 1 for bridges. W. J. Moore, Pembroke, engineer.

St. Angele de Laval, Que.
The Brown Corporation, La. Tuque, Quebec, is collecting data preparatory to building a $100,000 wharf. Geo. W. Boswell, 19 Ste. Germain St., Quebec, manager.

The Brown Corporation, La Tuque, Que., also contemplates a railway siding costing $16,000 and is having a survey made.

St. Bonaventure D'Upton, Que.
No closing date has been set for receiving tenders for a reinforced concrete bridge for the Town. Leopold Joyal, secretary, is receiving tenders. I. E. Vallee, Quebec, engineer.

Toronto, Ont.
F. G. Engleholm, Consulting Engineer for York Township, 56 Huntley St., will receive tenders until May 1 for a reinforced concrete bridge connecting Astley Ave. and the Nesbitt Estate.

Whitby, Ont.
Plans are drawn and tenders will be called shortly by the Dominion Government for the reconstruction of a pier at a cost of $19,500. R. C. Desrochers, Ottawa, secretary.

CONTRACTS AWARDED

Greenock Twp., Ont.
Hamilton Bridge Works Co., Ltd., Hamilton, have general contract for steel for a bridge for the Bruce County Council. J. McKinnon, Paisley, has the contract for concrete work.

Havelock, N. B.
Bruce L. Simmons, 621 Union St., Fredericton, has been awarded the general contract for "Upper Canaan" bridge costing $5,800 by the Provincial Government.

Ste. Anne de Beaupre, Que.
Town Council has awarded the contract for a steel bridge costing $6,925 to E. Gravel, Ste. Anne de Beaupre.

Winnipeg, Man.
W. A. Dutton, McArthur Bldg., has the general contract for grading for the C. P. R. between Cutknife and Battle River, Sask. Stewart & Cameron, Ltd., Grain Exchange Bldg., have the general contract for grading a branch line between Nacam and Melfort. J. C. Holden, District Engineer, has charge of this work.

Public Buildings, Churches and Schools

Arnprior, Ont.
Tenders for a heating system for the new High School will be received by the Board of Education until May 10. J. A. Ewart, Jackson Bldg., Ottawa, architect.

Brantford, Ont.
Tenders are being received until May 1 for an addition to the Collegiate Institute costing $81,000. A. K. Bunnell, secretary.

Calgary, Alta.
St. Stephen's Anglican Church, Rev. J. Canon, rector, proposes to build a $20,000 memorial hall, two storeys, 50 x 77 ft. on a concrete foundation.

Capreol, Ont.
Hall & Duerr, Lumsden Bldg., Toronto, are preparing plans for a theatre for Mr. O'Connor. Building will cost about $18,000.

Cascades, Que.
The Gatineau Sanitoria Ltd., contemplates a new building costing $50,000. J. F. Perry, Wakefield, Que., interested.

Gravenhurst, Ont.
Ronald W. Catto, 47 King St. W., Toronto and Messrs. Craig & Madill, 707 Yonge St., Toronto, will prepare plans for a $50,000 school of brick construction containing eight rooms. G. W. Gandrie, Gravenhurst, secretary.

Hull, Que.
Separate tenders for plumbing and heating for a $20,000 addition to a school for the Roman Catholic Commission will be called by Jos. Provost, secretary, about May 1.

Limoilou, Que.
Bergeron & Lemay, 145 St. John St., Quebec, are preparing plans for a church costing $150,000 for the parish of St. Francois de Assise.

Mimico, Ont.
The congregation of the Presbyterian Church contemplate a Sunday School costing $18,000. W. E. S. Savage, Mimico Ave., engineer.

Mitchell, Ont.
Site has been purchased and Board has been granted $50,000 by the Town to proceed with the proposed High School. Dr. McGill, chairman.

New Glascow, N. S.
Public School Board contemplates a school costing $25,000. Jas. Roy, secretary of the Board.

Oshawa, Ont.
Hutton & Souter, 804 Bank of Hamilton Bldg., Hamilton, have been appointed architects for the proposed municipal grandstand costing $25,000.

Board of Education will call for tenders shortly for a brick school costing $160,000. J. A. McGibbon, secretary.

Ottawa, Ont.
Tenders for a $40,000 addition to Asbury College will be received by Rev. Mr. Wollcombe until April 30. J. A. Ewart, Jackson Bldg., architect.

Riviere-du-Loup, Que.
Parish Hall contemplated by the Parish of St. Francios Xavier will cost about $10,000. No materials purchased except brick and steel.

Sherbrooke, Que.
L. N. Audet, 74 King St. W., is preparing plans for a $50,000 fire station for the Town Council. Building will be three storeys, 60 x 80, granite and brick construction on a concrete foundation.

Sudbury, Ont.
Liberty Hall Co. have the frame up for a $12,000 addition to their building. H. Puro, interested.

Tillsonburg, Ont.
An addition to the Public School contemplated by the Board. A. E. Raynes, secretary.

Toronto, Ont.
Upper Canada Law Society, Osgoode Hall, is having plans prepared for alterations to Osgoode Hall costing $75,000 by Darling & Pearson, 2 Leader Lane.

Tenders are wanted by the Separate School Board for a school until April 30 D. A. Carey, chairman.

A $50,000 addition will be made to the Western Hospital, Bathurst St. E. J. Lennox, 364 Bay St., architect.

Bulk tenders for a reception hospital are being received by the Board of Control until May 15. Building will consist of four wings one three storeys and basement, 86 x 36; two four storeys and basement, 70 x 36 each and one five storeys and basement, 80 x 36. Building will be of brick and steel construction.

Burden & Gouinlock, 101 King St. W., Toronto, have been appointed architects by S.S. No. 15, York Township, to prepare plans for an addition to the memorial school at Fairbank.

Truro, N. S.
Plans are being prepared by the Maritime Home for Girls, Brunswick St., for a cottage and school costing $40.000. E. D. Vernon, 153 Dominion St., architect.

CONTRACTS AWARDED

Ennismore, Ont.
R. Sheehy, 751 George St., Peterboro, has the general contract for the Roman Catholic Church costing $60,000.

Lakeview, Ont.
Fred Cubbidge, 685 Windermere Ave., Toronto, has the general contract for a school for S.S. No. 7, Toronto Twp., costing $38,000.

Moose Jaw, Sask.
P. W. Graham, Moose Jaw, has the general contract for the addition to the Hospital at $46,825.

New Waterford, N. S.
W. A. Rudderham, St. Peter's Rd.

Sydney, has the general contract for a hospital costing $70,000. A. J. McCormack, Ross Block, Sydney, architect.

Ottawa, Ont.
Italian Mosaic & Marble Co. Ltd., 442 King St. West, Toronto, have the contracts for marble and tile floors for Ottawa Hospital at $99,475. Plumbing, drainage service building and heating service building, awarded to the Garth Co., Craig St. W., Montreal.

St. Charles, Que.
Paquet & Godbout, St. Hyacinthe, have the general contract for a church to cost $56,000. Tenders will be called in about one month for electrical work, plumbing and heating by the architect, S. R. Richer, 240 Girouard St., St. Hyacinthe.

St. Leon-de-Standon, Que.
The general contract for the erection of a $48,000 church has been awarded to E. Pellitier, 70 St. Cyrille St., Quebec. Pierre Levesque, Quebec architect.

Toronto, Ont.
Lioni & Co., 1450 Dufferin St., have the contract for excavating for the addition to the Bay St. sub-station for the Toronto Electric Commissioners. Hamilton Bridge Co., General Accident Bldg., has the contract for structural steel while the the plumbing contract was awarded to Mechanical Trades Co. Ltd., 54 University Ave.

Waterloo, Ont.
The Lutheran Seminary, Albert St., is building a $40,000 college and has awarded the contract to Ellert Bros., Kitchener.

Business Buildings and Industrial Plants

Cranbrook, B. C.
Plans are being prepared and the Cranbrook Hotel Co., Cranbrook, are excavating for a $15,000 building. Tenders will be called as soon as the plans are ready.

Hamilton, Ont.
James Shekter, 78 George St., is having plans prepared for stores and apartments costing $50,000.

Hanley, Sask.
G. D. Morgan, Hanley, proposes to build an $8,000 theatre one storey, concrete foundation, 34 x 88.

Jasper Park, Alta.
The Canadian National Railways, A. E. Warren, Winnipeg, Manager of Western Lines, will build a two storey addition to an hotel at a cost of $10,000. Building will be of frame construction on a concrete foundation.

London Ont.
A $10,000 factory is contemplated by the Green River Bottling Co., William Street.

Moncton, N. B.
Stores and dwellings costing $20,000 planned by C. A. Gourley, 115 St. John Street.

J. H. Marks. 135 Botsford St., contemplates a $20,000 warehouse.

Montreal, Que.
Gascon & Parent, 502 St. Catherine St., E. are preparing plans for a three storey garage, 75 x 116, brick on a concrete foundation, costing $60,000. Tenders will be called shortly by the architects. Central Garage, 249 Laval Ave., owners; Mile Parrott, manager.

D. Daoust, 1364 St. Hubert St., is excavating for store and flats to cost $25,000.

Under the supervision of the Harbor Commission a grain elevator costing $2,500,000 will be erected. M. P. Fennel, Jr., manager.

New Toronto, Ont.
Tenders will be called by Neil Beggs, architect, 6 Jean St., shortly, for a theatre costing $60,000.

North Temiskaming, Que.
Co. Delholle. North Temiskaming, contemplates building an hotel.

Ottawa, Ont.
Plans are drawn for a turbine building for J. R. Booth, Ltd., Booth St. Structure estimated to cost $30,000.

D. G. Cowan, Bank & Cameron St., will build a garage and warehouse costing $6,000. No material yet purchased.

Quebec, Que.
Pierre Levesque, architect, 115 St. John St., is preparing plans for a fireproof branch bank to cost $45,000.

Saskatoon, Sask.
Leonard Construction Co., has the general contract for a grain elevator for Quaker Oats Co., Saskatoon, having a capacity of 250,000 bushels and costing $100,000.

St. Angele de Laval, Que.
With a site containing 400 acres of land purchased, the Brown Corpn., La Tuque. Que., contemplates a paper mill costing $5,000,000. The company's engineer is preparing preliminary plans. Geo. Boswell, 19 Ste. Genevieve St., Quebec manager.

Yolles & Rottenburg, 366 Adelaide St. W., are preparing plans for a fourteen storeyl office building, 107 x 186, reinforced concrete construction, estimated to cost $1,000,000. Thirty days will be required to wreck the building occupying the site and construction is expected to start about Aug. 1.

Toronto, Ont.
Dr. W. J. McCormick, 16 Gothic Ave., is receiving tenders on plumbing, heating, electrical work, plastering, painting and drains and concrete for a six suite apartment house and cafeteria under construction on Bloor St. West.

A 20x40 brick store with an apartment above will be built by T. Worrall, 1 Goldwin Ave., Mount Dennis, on Jane St. near Graham St.

About May 15 Neil G. Beggs, 6 Jean St., will call tenders for brick work and steel work for a one storey factory, 100 x 600 with a two storey office building, 110 x 50 and a two storey assembly building 100 x 600 all of steel and brick construction. Other tenders will probably be called in June.

A. Proudfoot, 232 Hillsdale Ave., is excavating for a $40,000 bowling alley and recreation building.

W. Pendleton, 615 Greenwood Ave., is building a $10,000 store for Geo. Leo, 1289 Gerrard St. east.

Vancouver, B. C.
Baynes & Horie, 846 Howie St., have the general contract for a one storey mill construction warehouse, 110 x 280, costing $27,500.

Verdun, Que.
A store and two flats costing $18,000 will be built by L. Marquis, 294 Marquette St., for J. Reid.

Windsor Mills, Que.
Kilgour Bros., 21 Wellington St., Toronto, Ont., will shortly call tenders for a factory costing $100,000. D. C. Cotton, 54 Adelaide St., W. Toronto, architect.

CONTRACTS AWARDED

Chilliwack, B C.
Chilliwack United Grain Grower's Association are excavating for a frame pre-cooling plant costing $13,000. Linde Canadian Refrigeration Co. have the general contract.

Fredericton, N. B.
Purity Ice Cream Co. Ltd., Stanley St., has awarded the general contract for the $6,000 extension to their plant to A. & R. Forbes, Fredericton.

Kingston, Ont.
John V. Gray Construction Co. Ltd., 541 Queen St. east, Toronto, has the general contract for a branch for the Bank of Montreal.

Kitchener, Ont.
Ball Bros., Kitchener have the general contract for car barns for the Light Commission costing $40,000. Hamilton Bridge Works Co. Ltd., Hamilton, is supplying the steel.

New Toronto, Ont.
Austin Construction Co., Cleveland, O. have the general contract for an addition to the factory of R. N. Boxer Co. Ltd., Foy Bldg., Toronto. Contract for steel sash awarded to Canadian Metal Window & Steel Products Ltd., 160 River St., Toronto.

Port Haney, Ont.
Linde Canadian Refrigeration Co., Vancouver are building a frame pre-cooling plant for the Maple Ridge Grower's Association, Port Haney.

St. Catharines, Ont.
Newman Bros., 75 St. Paul St., have the general contract for a store and flats costing $15,000.

Sherbrooke, Que.
The general contract for the New Sherbrooke Hotel costing $25,000 has been awarded to K. B. Jenckes, 25 Moore St. The contract for steel awarded to MacKinnon Steel Co. Ltd., Drummond Rd.

Toronto, Ont.
Contracts awarded on the Cocoa-Cola Bottling plant are as follows: Reinforced steel, Burlington Steel Co., Toronto; Spirals & Column forms, H. J. Aldington, Toronto; Roofing & Sheet Metal, W. A. Moffatt, Toronto; Plumbing & Heating, Purdy Mansell, Toronto.

Sullivan & Fried, 81 Victoria St., have the general contract for a one storey office building, brick, for Frank Ryan, 1327

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

Tenders Wanted for Governor's Bridge

Tenders will be received by F. G. ENGHOLM, 56 HUNTLEY STREET, TORONTO, TELEPHONE NORTH 7845, until **Tuesday noon 1st of May 1923,** for reinforced concrete bridge connecting ASTLEY AVENUE with NESBITT ESTATE, ROSEDALE, TORONTO.

The lowest or any tender will not necessarily be accepted.

PLANS, SPECIFICATIONS AND COMPLETE SCHEDULE OF QUANTITIES obtainable on application to

F. G. ENGHOLM,
Consulting Engineer for Township of York.
17

Tenders for Electrical Supplies

Tenders addressed to the Board of Control will be received by its Secretary, City Hall, Ottawa, up to 12 o'clock noon (Standard Time) on the

3rd day of May, 1923,

for the supply of Electrical Apparatus.

Specifications and tender forms may be obtained upon application to the office of the Commissioner of Works, Ottawa.

A. F. MACALLUM,
Commissioner of Works.
City Hall, Ottawa, April 13th, 1923. 17

TENDERS

Construction of Water Works

TOWN OF HANOVER

Separate or combined tenders for the supply of GATE VALVES, RELIEF VALVES, VALVE BOXES, FIRE HYDRANTS, CENTRIFUGAL PUMPS, MOTORS, GASOLINE ENGINES, BRASS SCREENS, CHLORINATOR, ETC., and for the construction of PUMP HOUSE, CONCRETE RESERVOIR, LAYING WATER MAINS, EXCAVATION, AND TEAMING are invited by the Cuncil of the Town of Hanover up to 2.00 P.M. on

Thursday, May 10th, 1923,

Detail information may be obtained from the Consulting Engineers.

Plans and specifications may be seen at the office of the Engineers or the Town Clerk.

JOHN TAYLOR, Esq.,
Town Clerk,
Hanover, Ont.

F. W. THOROLD CO. LIMITED,
Consulting Engineers,
54 Admiral Road,
TORONTO.
17 18

RATES

80 cents per agate line (14 lines to the inch) Positions Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

TENDERS

Tenders will be received by the Separate School Board of Toronto for the erection of an eight room school in Dewson Street, Toronto.

Plans and specifications may be seen at the office of the architect, J. P. Hynes, 73 King Street West, Toronto.

Tenders close at five o'clock p.m. April 30th, 1923, at the office of the board, 477 Jarvis Street, Toronto.

Lowest or any tender not necessarily accepted.

E. F. Henderson,
16-17 Business Agent for the Board.

Tenders Wanted for Drainage Work

Sealed tenders, marked "Tenders for Drain", will be received by the undersigned until, and including

May 1st, 1923,

for furnishing requisite materials for excavating, enlarging and completing, Phelpston Marsh Drain in accordance with the specifications and profiles relating thereto.

Plans and specifications may be seen at the office of the Township Clerk of Flos, Elmvale, Ontario, and at the Office of J. J. Newman, Engineer, Windsor, Ontario.

Marked cheque for 10 per cent of the amount of the tender must accompany tenders.

Lowest or any other tender not necessarily accepted.

C. S. BURTON, Clerk Flos,
16-17 Elmvale P.O., Ontario.

Town of Campbellton, N. B.

Tenders for Pavement

Sealed tenders plainly marked as to contents will be received by the undersigned until

7th of May, 1923.

for the construction of, Hot Mixed Paving 36,000 sq. yards.

Plans, specifications and form of tender may be seen at the office of the Engineer.

The lowest or any tender not necessarily accepted.

R. J. SANDOVER SLY,
Town Engineer.
Town Engineer's Office,
Campbellton, N.B. April 11th, 1923. 16-18

TENDERS

BRUCE COUNTY

Sealed tenders, plainly marked as to contents will be received by the undersigned until 1 P.M.

Tuesday, May 8th, 1923,

for the construction of a 50 ft. Reinforced Concrete Girder Bridge one mile south of Ripley; concrete abutments and floor of 90 ft. bridge and steel superstructure of same, four miles east of Paisley.

Separate tender for each of the above three items and tender to be accompanied by marked cheque payable to County Treasurer for 5% of tender.

Lowest or any tender not necessarily accepted.

Plans and specifications may be seen at office of undersigned.

G. E. STEPHENSON,
County Engineer,
17 Walkerton, Ont.

Tenders Wanted

Sealed tenders will be received by the undersigned up until twelve o'clock noon

Saturday, May 12th,

for the erection of a THREE STOREY FIRE PROOF MEMORIAL HOSPITAL for the city of St. Thomas, Ontario. Tenders separate or in bulk.

Plans, forms of tender and all particulars can be obtained at the office of the undersigned. Plans can also be seen at MacLean's Building Reports Limited, Toronto.

The lowest or any tender not necessarily accepted.

DARRACH & FINDLAY,
Architects,
Room 4, 430 Talbot St.,
ST. THOMAS, ONT.
17-18

COUNTY OF ESSEX

Suburban Roads

Sealed tenders marked "Tender for Concrete Road" and addressed to W. P. Coyle, County Clerk, Sandwich, Ont., will be received until 1 o'clock, P.M. on

Tuesday the 8th day of May, 1923,

for the construction of approximately three miles of concrete road.

A marked cheque for $2,000.00 must accompany each tender.

Plans, specifications and form of tender may be obtained from W. P. Coyle, County Clerk, J. J. Newman, Engineer in charge, Windsor, Ont., or John F. Millen, Sec. Windsor Suburban Area.

No tender necessarily accepted.

JOHN F. MILLEN,
Sec. Windsor Suburban Commission,
Sandwich, Ont. 17-18

Tenders for Dredging

Sealed tenders addressed to the undersigned and endorsed "Tender for dredging, Bowmanville", etc., as the case may be, will be received **until 12 o'clock noon, Friday, May 11, 1923**, for dredging required at Bowmanville, Midland. Penetanguishene, Port Hope, Sault Ste. Marie, Point Traverse, Ont., Nicolet, River St. Charles, Riviere du Loup and St. Pierre les Becquets, P.Q.

Tenders will not be considered unless made on forms supplied by the Department and according to conditions set forth therein.

Combined specification and form of tender can be obtained on application to the undersigned, also at the offices of the District Engineers, Equity Building, Toronto, Ont., Shaughnessy Building, Montreal and at the Post Office Building, Three Rivers, P.Q. Tenders must include the towing of the plant to and from the work.

The dredges and other plant which are intended to be used on the work shall have been duly registered in Canada at the time of the filing of the tender with the Department, or shall bave been built in Canada after the filing of the tender.

Each tender must be accompanied by an accepted cheque on a chartered bank payable to the order of the Minister of Public Works, for 5 p.c. of the contract price, but no cheque to be for less than fifteen hundred dollars. War Loan Bonds of the Dominion will also be accepted as security, or War Bonds and cheques if required to make up an odd amount.

By Order,

R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, April 23, 1923. 17

Equipment for Sale

Complete equipment for rock quarrying and macadam road construction. Apply Box No. 217, Contract Record, Toronto. 15-T.f.

Sealed tenders addressed to the undersigned and endorsed "Tender for renewal of revetment wall at Chatham, Ont.," will be received at this office until **12 o'clock noon Wednesday, May 16, 1923**, for the renewal of 182 ft. of the revetment wall at McGregor's Creek, Chatham, Kent County, Ont.

Plans and forms of contract can be seen and specification and forms of tender obtained at this Department, at the offices of the District Engineers, Royal Bank Building, London, Ont.; Equity Building, Toronto, Ont., and at the Post Office, Chatham. Ont.

Tenders will not be considered unless made on printed forms supplied by the Department and in accordance with conditions contained therein.

Each tender must be accompanied by an accepted cheque on a chartered bank payable to the order of the Minister of Public Works, equal to 10 p.c. of the amount of the tender. War Loan Bonds of the Dominion will also be accepted as security, or War Bonds and cheques if required to make up an odd amount.

Note—Blue prints can be obtained at this Department by depositing an accepted bank cheque for the sum of $10.00, payable to the order of the Minister of Public Works, which will be returned if the intending bidder submit a regular bid.

By Order,

R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, April 23, 1923. 17

For Sale—Cheap

1 Wettlaufer Mixer, capacity 6 cu. ft. unmixed materials on trucks, with power charging skip, water tank, with gasoline engine—thoroughly overhauled and painted. K. W. Lewis, 105 Front St. E., Toronto, Ontario. Phone Main 1498. 17

Tenders for Highway Construction

Separate sealed tenders marked "Tender for Contract No. ......" will be received by the undersigned until 12 o'clock noon on **Tuesday, May 8th, 1923**, for the following work on the County Roads in the United Counties of Stormont, Dundas and Glengarry.

Cont. No.	Rd. No.	Twp.	Location	Remarks
32.	101	Mountain,	No. 3 easterly.	½ mile LCS.
	2	Mountain,	Baldwins Bridge southerly.	½ mile LCS.
	3	Mountain,	Inkerman Sta. to Inkerman.	2 miles WBM.
33.	1	Matilda,	Across Cons. 1 and 2.	3 miles 12′ WBM.
34.	1	Matilda,	Cons 3 to 8.	Concrete Culverts.
35.	5	Matilda,	Wmburg Bndy westerly.	3½ miles LCS.
36.	4	Winchester,	Winchester Village.	½ mile WBM.
37.	101	Winchester,	Chesterville Bridge Southerly.	1 mile WBM or Bituminous Penetration.
38.	26	Wmburg,	Pt. Cons 5 and Cons 7 and 8.	3 miles 16′ WBM.
39.	7	Wmburg,	Front of Cons 7 Wmburg to Winchester Boundary.	2 miles 12′ gravel and grading.
40.	7	Wmburg,	Williamsburg to Dunbar.	Concrete Culverts.
41.	101 10 27	Winchester, Finch Township, Finch Township,	Finch Boundary to Avonmore.	Concrete Culverts.
42.	12	Osnabruck,	Provincial Highway northerly.	5 miles of grading.
43.	12	Where required.		Concrete Culverts.
44.	13	Roxborough,	C.P.R. No. 101 Avonmore.	¼ mile 20′ Bituminous Penetration.
	101	Roxborough,	Through Avonmore and easterly.	¼ mile 20′ B.P. and 1 mile 16′ WBM.
45.	101	Roxborough,	Finch Bndy to Avonmore.	1½ miles grading.
46.	84	Cornwall,	Cons 2	1¼ miles Bituminous. Penetration 16′ wide.
	84	Cornwall,	St. Andrews to Bonneville.	2½ miles WBM. 16′ wide.
47.	19	Charl.	Finney's Bridge westerly.	2 miles 12′ WBM.

Plans, specifications and information to bidders may be seen and tender forms may be obtained on and after May 1st, 1923 at the office of the undersigned.

A marked cheque for 10% of the tendered price, payable to the Treasurer of the United Counties of Stormont, Dundas and Glengarry or a Guaranty Company's bid bond for a similar amount must be attached to each tender. A Guaranty Company's Bond for 50% of the amount of the tender, or a cash deposit of 10% shall be furnished by the Contractor when the contract is signed.

The lowest or any tender not necessarily accepted.

J. G. CAMERON,
County Engineer.

County Highway Department, County Buildings, Cornwall.
April 20th, 1923. 17

TOWN OF SEAFORTH

Tender for Laying Water Mains

Sealed tenders marked and addressed to Mr. John Wilson, Clerk, Seaforth, Ontario, will be received until

May 15th, 1923,

for laying approximately three and a quarter miles of six and eight inch water mains.

Plans and specifications may be seen and forms of tender obtained from the engineers, James, Proctor & Redfern, Limited, 35 Toronto Street, Toronto, or from the Town Clerk of Seaforth.

The lowest or any tender not necessarily accepted.

JOHN WILSON,
Clerk.
W. GOLDING,
Mayor.

17

TOWNSHIP OF ETOBICOKE

Area No. 4 Waterworks Extension

Sealed tenders plainly marked as to contents will be received by the Council of the Township of Etobicoke up to noon

Saturday, May 5th, 1923,

for:-

1.	Supplying Cast-Iron Pipe	9700 ft.
2.	Supplying Cast-Iron Specials	6500 lbs.
3.	Supplying Hydrants	14
4.	Supplying Valves and Boxes	19
5.	Laying Mains	9700 ft.

Plans and specifications may be seen and Forms of Tender obtained at the Township Offices, Islington.

The lowest or any tender need not necessarily be accepted.

N. MacNICOL,
Township Engineer,
Islington.

17

Tenders for Pavement

Sealed tenders will be received by Henry Clarke, Clerk of the Village of Elora until 12 noon,

Monday, May 7th,

for the construction of approximately 13,900 sq. yds. of pavement and other work in connection therewith for the Village of Elora, Ontario.

Alternative tenders will be received for one course concrete pavement and for an asphalt top on a concrete base.

A marked cheque for 2½% of the Contract Price shall be enclosed with the tender.

Plans, specifications and information for bidders may be seen at the Clerk's office in Elora or at the office of the Engineers on and after Monday, April 30th.

The lowest or any tender not necessarily accepted.

A. W. CONNOR & Co.,
Consulting Engineers,
34 Victoria St.,
TORONTO.

17

Some One Wants to Buy

The equipment or machinery that you are not using.

It may be occupying valuable space in your yard or shop, collecting dust, rust and hard knocks.

Sell it before "Depreciation" scraps it.

Use the Tender & For Sale Department. It helps others, let it help you.

TOWN OF MERRITTON

Tenders for Pavement

Sealed tenders, marked "Tender for Pavement" and addressed to Richard Clark, Town Clerk, Merritton, will be received until 6 o'clock p.m. on

Friday, May 4th, 1923,

for the construction of approximately 3500 square yards of Concrete Pavement.

Full information may be obtained from the Engineer.

No tenders necessarily accepted.

F. N. RUTHERFORD,
Town Engineer,
24 Queen St., St. Catharines, Ont. 17-18

Tenders for Bridges and Culverts

County of Kent

Sealed tenders will be received by the undersigned up till noon on

Friday, May 4th, 1923,

for the construction of nine concrete and steel bridges and culverts in the County of Kent. One bridge is of seventy feet span and the other bridges and culverts vary from eight feet span to sixteen feet span.

Plans and specifications and forms of tender and contract may be seen at the office of W. G. McGeorge, C.E. Chatham, Ontario.

The lowest or any tender not necessarily accepted.

L. A. PARDO,
County Road Superintendent,
16-17 Chatham, Ontario.

Tenders for Improvement of Road

Pursuant to the requirements of The Canada Highways Act, sealed tenders marked "Tenders for Project 22, Section B, subsection (c)" will be received by the undersigned until twelve o'clock noon on

Wednesday, May 16th, 1923,

for the excavation of approximately 35,000 cubic yards of earth and other work required in the construction of Provincial highway from Stockholm to Dubuc.

Copies of plans, profiles and specifications may be seen at the office of the undersigned, and at the office of each of the following parties:-

W. M. Grant, 105 Ross Block, Saskatoon, Sask.; J. R. Reid, Court House, Swift Current, Sask.; F. G. Kissack, Dominion Grain Co., North Battleford, Sask.; H. Munchy, Sec.-Treasurer R.M. No. 183, Stockholm, Sask.

An accepted cheque for the sum of $700.00 payable to the Deputy Minister of Highways, or a Guarantee Company's bid bond, must accompany each tender.

The right to reject any or all tenders or to waive any defects or irregularities therein is to be at the discretion of the Minister of Highways. Tenders will be opened in public in the office of the Deputy Minister at the hour of 4 p.m. Wednesday, May 16th, 1923.

The unauthorized insertion of this advertisement will not be paid for.

H. S. CARPENTER,
Deputy Minister of Highways.
Department of Highways, Regina, Sask.
April 25th, 1923. 17

Tenders for Improvement of Road

Pursuant to the requirements of The Canada Highways Act, sealed tenders marked "Tenders for Project 18, Section C", will be received by the undersigned until twelve o'clock noon on

Wednesday, May 16th, 1923,

for the excavation of approximately 58,000 cubic yards of earth and other work required in the construction of Provincial highway from Glen Ewen West fourteen and one-half miles.

Copies of plans, profiles and specifications may be seen at the office of the undersigned, and at the office of each of the following parties:-

W. M. Grant, 105 Ross Block, Saskatoon, Sask.; J. R. Reid, Court House, Swift Current, Sask.; F. G. Kissack, Dominion Grain Co., North Battleford, Sask.; E. J. D. Jones, Sec-Treasurer R.M. No. 3 Oxbow, Sask.

An accepted cheque for the sum of $1,000.00 payable to the Deputy Minister of Highways, or a Guarantee Company's bid bond, must accompany each tender.

The right to reject any or all tenders or to waive any defects or irregularities therein is to be at the discretion of the Minister of Highways. Tenders will be opened in public in the office of the Deputy Minister at the hour of 4 p.m. Wednesday, May 16th, 1923.

The unauthorized insertion of this advertisement will not be paid for.

H. S. CARPENTER,
Deputy Minister of Highways.
Department of Highways, Regina, Sask.
April 25th, 1923. 17

Tenders for Improvement of Road

Pursuant to the requirements of The Canada Highways Act, sealed tenders marked "Tenders for Project 16, Section B, subsection (a)" will be received by the undersigned until twelve o'clock noon on

Wednesday, May 16th, 1923,

for the excavation of approximately 48,000 cubic yards of earth and other work required in the construction of Provincial highway Fairlight to Wawota.

Copies of plans, profiles and specifications may be seen at the office of the undersigned, and at the office of each of the following parties:-

W. M. Grant, 105 Ross Block, Saskatoon, Sask.; J. R. Reid, Court House, Swift Current, Sask.; F. G. Kissack, Dominion Grain Co., North Battleford, Sask.; C. N. Syme, Sec.-Treasurer of R. M. No. 92, Wawota, Sask.

An accepted cheque for the sum of $1,000.00 payable to the Deputy Minister of Highways, or a Guarantee Company's bid bond, must accompany each tender.

The right to reject any or all tenders or to waive any defects or irregularities therein is to be at the discretion of the Minister of Highways. Tenders will be opened in public in the office of the Deputy Minister at the hour of 4 p.m. Wednesday, May 16th, 1923.

The unauthorized insertion of this advertisement will not be paid for.

H. S. CARPENTER,
Deputy Minister of Highways.
Department of Highways, Regina, Sask.
April 25th, 1923. 17

Town of Brampton

Sealed tenders addressed to the undersigned Town Clerk, will be received up till 6 p.m.

Wednesday, May 2nd, 1923,

for the construction of a Brick Abutment and Concrete Floor on Main Street, South, Brampton, Ontario.

Plans and specifications may be seen at the office of the Town Engineer.

Marked cheque for $400.00 must accompany each tender.

The corporation reserves the right to reject any or all tenders.

The lowest or any tender will not necessarily be accepted.

C. M. CORKETT,
Town Clerk.
W. M. TREADGOLD,
Town Engineer.
Brampton, Ontario 17

TENDERS for Reception Hospital

Separate or bulk tenders for the work included in the specifications of the trades mentioned below in connection with the erection and completion of Reception Hospital in Surrey Place will be received by registered post only, addressed to the undersigned up to 12 o'clock noon on

Tuesday, May 15th, 1923,

(1) Mason Work
(2) Carpenter Work.
(3) Elevator.
(4) Metal work and Ventilation, etc.
(5) Plumbing.
(6) Heating.
(7) Wiring and Light Fixtures.
(8) Plastering.
(9) Painting and Glazing.

Plans and specifications may be seen and forms of tender and all information obtained at the office of the City Architect, City Hall, Toronto. Envelopes containing tenders must be plainly marked on the outside as to contents. Conditions relating to tendering as prescribed by city by-laws, specifications, etc., must be strictly complied with or tenders may not be entertained. Tenderers shall also submit with tender a surety company approved by the City Treasurer to guarantee the execution of the awarded contract.

The lowest or any tender not necessarily accepted.

C. ALFRED MAGUIRE, (Mayor),
17 Chairman Board of Control.

To Rent

Steam Road Roller, First Class Shape. The T. Sidney Kirby Co. Limited, 213 Sussex St., Ottawa. 16-T.f.

FOR SALE

No. 6 Gates Gyratory Crusher Type K with extra parts and in good running condition. Also 12 H.P. heavy duty gasoline engine. Both for immediate sale. Apply R. H. Miner Company, Ltd., 207 St. James Street, Montreal. 15-18

WANTED

In Montreal and Toronto reliable representative for a splendid line of building specialties. Must be in constant touch with architects in his locality. Box 234, Contract Record, Toronto. 17-18

For Sale

1—T. Cooke Sons, Engineers R.R. Transit, with tripod, almost new, $225.00.
1—Gurley 22" Y. Level with tripod, $120.00.
3—14 ft. rods, at $10.00 each.
M. L. Williams, 29a Belmont St., Montreal.
17-18

STEEL PILING

Bought and Sold
Universal Equipment Company
Niagara Falls. 11-T-f.

FOR SALE

Keystone Excavating Machine, complete with two sticks, skimmer scoop, and three ditching scoops; this machine has been used only one season and is guaranteed to be in first class condition. Price $4,500 f.o.b. St. John, N. B.

Austin Backfiller with caterpillar traction, 4-cylinder Buffalo engine, in equally good condition. Price $2,500 f.o.b. St. John, N. B. Canada Lock Joint Pipe Limited, 65 Pleasant Boulevard, Toronto, Ont.; or St. John, N. B. 8-T.f.

FOR SALE

1—12 ton Waterous Road Roller.
1—16½ D Acme Jaw Crusher, size of opening 16" x 32".
1—Steel frame Elevator, 30 ft. long.
1—Revolving Screen 36" x 12'.
11—Jack Knife self dumping quarry cars 30" gauge.
About 2,000 ft. 20 pound rail.
1—Sawyer-Massey 20 H.P. Steam Tractor.

This roller is at Belleville. Balance of equipment at Clappison's Corners, near Hamilton, Ontario.

H. T. ROUTLY,
53 Yonge Street,
Toronto.
17

FOR SALE

25 Ton Industrial Locomotive Crane 8-Wheel, 50 ft. Boom.
1250 Yard Barber Portable Asphalt Plant.
3 Ton Plymouth Gasoline Locomotive, 36" gauge.

WILSON EQUIPMENT CO.,
117 Wellington West, - Toronto
Phone: Adel. 8069 Nights: Park. 3296W
16-17

FOR SALE

All Steel Derrick Car

This is a Standard, Steel Centre, Girder Construction Flat Car
36 feet long—100,000 lbs. Capacity,
on which is Erected Marsh & Henthorne Double Drum, Double Cylinder Engine with Two Independent Niggerheads;
Separate Friction, Swinging Gear Direct Connected to Engine;
Vertical Steel Boiler—Wooden Cab
All Steel Counterweight Derrick with 32 foot Steel Boom; Lifting Capacity about 5 Tons at 20 ft. Radius.
Car is Self-Propelled by Chain Drive arranged for on Both Trucks.
Complete with Cable and Blocks—Ready for Operation.

THE MARITIME BRIDGE CO. LTD.,
New Glasgow, N.S. 17

Wanted to Hire

A fleet of Ford Ton Dump Trucks. Steady work for most of season. Box 216, Contract Record, Toronto. 16

Contractors Attention!

A limited number of practically new heavy duty Mack Contractors' Dump Trucks are available at once at wonderful prices. Not war-time products but 1922 four speed jobs with guarantees. This is a snap which seldom occurs. Cash or terms. Write or call.

S. G. STOOTHOFF,
323 Jarvis Street,
TORONTO. 17

GENERAL CONSTRUCTION SUPERINTENDENT wants job. Thoroughly practical with twenty years experience. Last job Quarter of a Million. A1 references. Go anywhere. Box 231, Contract Record, Toronto. 17-20

WANTED—General Foreman to take charge of concrete bridge work. Must be thoroughly competent, reliable and able to show results. State experience in full, also references and salary required| Apply Box 225, Contract Record, Toronto. 16

CONSTRUCTION SUPERINTENDENT with 15 years experience handling all classes of building and water work, wants position. A1 testimonial and guarantee results. Will go anywhere, Box 205, Contract Record, Toronto. 15-17

We Issue Surety Bonds

for Contractors, for Public Highways, Contracts and all Municipal and private Corporation work.

We keep up to date information on contracts let and tenders called.

Try our service.
Phone Main 3476

Special Toronto Representatives
Fidelity Insurance Co. of Canada

STANLEY MOSS MANAGER
FIDELITY AGENCY OF CANADA LIMITED
THIRTY SIX TORONTO STREET

CONSTRUCTION SUPERINTENDENT and engineer, experienced, successful handling bridges, buildings, general contracting, also costs, figuring, etc., open for position with contracting company. Box 237, Contract Record, Toronto. 17

ARCHITECTURAL DRAUGHTSMAN WANTED capable of designing and overseeing steam and hot water installations for schools, churches and business buildings, also familiar with structural steel, reinforced concrete and general architectural work. Good position for right man. Only strictly temperate man need apply. Give references. Samples of work and wages required, also places held last three years. F. Neil Brodie, Architect, 42 Princess Street, St. John, N.B. 16-18

Bloor St. W. Building will cost about $15,000.

John Copp, 31 Balmoral St., has the general contract for three stores and bowling alley on North Yonge St., for Jas Pears Jr. to cost $50,000.

An $80,000 shipping warehouse is being built by the Toronto Harbor Commission at the foot of Bay St. Construction department of the Commission is doing the work by day labor.

Residences

Acton, Ont.

J. B. McKenzie, Georgetown, will build a $10,000 dwelling for Mrs. Sydney Smith, Acton.

Burlington, Ont.

A $15,000 residence is being built on the Toronto-Hamilton Highway for Kent Hamilton, 407 Queen St., Hamilton.

A $15,000 residence is being built on the Hamilton-Toronto Highway by Luther Holton, 312 Bay St., Hamilton. S. McPhie, Bank of Hamilton Bldg., architect.

Jas B. Gilles, 55 Barton St., Hamilton, is also building a $15,000 residence on the Highway, near Burlington.

Calgary, Alta.

J. M. Sills, 633-14th Ave. W., is having

WE WILL BOND YOU

The Contractor who obtains our bond may consider that he has received an undeniable mark of recognition as to his ability to perform a contract which he has undertaken.

Resources over - - - $31,790,000
Canadian Securities - $ 2,247,500

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36 Toronto Street
TORONTO

Arthur. E. Kirkpatrick
General Manager for Canada

BRANCH OFFICES
Paris Building
WINNIPEG

112 St James St.
MONTREAL

Sidney. W. Band
Assistant General Manager

W. R. Kirkpatrick
Canadian Secretary

UNITED STATES FIDELITY & GUARANTY COMPANY

Building Satisfaction

Providing adequate heating and ventilation is a big step toward insuring the success of your building. For comfort, production and efficiency depend largely on keeping the temperature right and the air pure.

For your own sake, therefore, insist on Sturtevant installations—for thereby you build lifelong satisfaction into the building.

Get folder 606 and invite our engineers to co-operate.

B. F. Sturtevant Company
of Canada, Limited
Montreal - Galt - Toronto

Sturtevant
PUTS AIR TO WORK

plans prepared for an apartment costing $8,000.

Hamilton, Ont.
Blain Bros., general contractors, 127 Emerald Ave. N., propose to build ten to fifteen brick residences costing $6,000 each.

A brick dwelling costing $7,500 contemplated by B. J. McFayden, 9 Garfield Ave.

Six residences costing $21,000 are contemplated by Michael Holland, 63 Victoria Ave.

Plans are being prepared for a duplex residence costing $8,000 for H. Wise, 105 Oak St.

Kitchener, Ont.
J. Bahnsen, 750 King St. W., wants tenders on a brick residence costing $13,000.

Lindsay, Ont.
Residence planned by W. Lloyd Wood, Jr., Bond St., will cost $6,000. T. Hornsby, 4 William St. N., architect

London, Ont.
Plans for an addition to an apartment house costing $20,000 are being prepared for Gordon Wright, 420 Ridout St. Structure will be of brick, three storeys, concrete foundation.

Moncton, N. B.
Moncton Construction Co., Weldon & Union Sts., Moncton, plan to build a residence costing $8,000.

MacLean Reports
Cover Canada

MacLean Building Reports will give you accurate, advance information on every building and engineering contract of consequence in the Dominion.

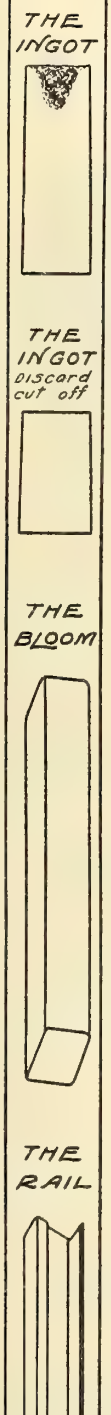
These reports are issued daily and reach subscribers in ample time to bid on the work or submit prices for the machinery, equipment, materials or supplies required.

Subscriptions may be placed for any one city, portion of a Province or more than one Province. Rates range from $25 yearly for the smallest cities to $500 yearly for the entire Dominion.

Hundreds of firms are deriving much financial benefit from the use of MacLean Building Reports. Tell us what territory you cover and put it up to us to show how we can help you get more business.

Try this service out. The result will please you. Write today for rates and free sample reports.

MacLEAN BUILDING REPORTS Ltd
345 Adelaide St. W. - - TORONTO
119 Board of Trade Building - MONTREAL
325 Main St. - - - WINNIPEG
106 Winch Bldg. - - VANCOUVER



BURLINGTON STEEL Co. LTD.

· HAMILTON · ONT ·

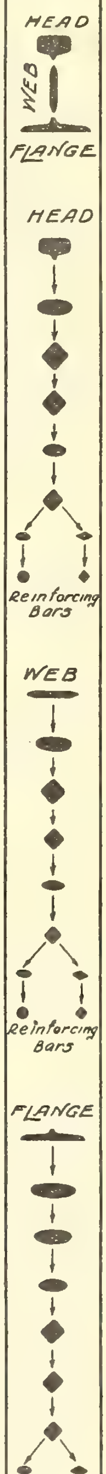
·· RAIL · CARBON ··
· STEEL · BARS ·
FOR — CONCRETE — REINFORCING

ROUNDS SQUARES FLATS
TWISTED SQUARES
CHANNELS ANGLES
SPECIAL SECTIONS
BARS BENT TO SHAPE FOR
BEAMS, STIRRUPS, ETC.

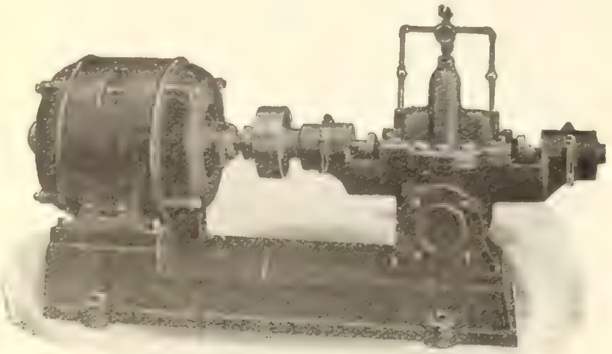
We have every modern facility at our plant for bending to your schedule and will ship the bars to you, bent, cut to length and tagged.

We are the sole manufacturers in Canada of RAIL-CARBON steel bars and our product is in accordance with the American Society of Testing Materials Specification serial designation A-16-14.

· ACCURATE · AND · PROMPT · SHIPMENT · GUARANTEED ·



SPRING



Every manufacturer of pumps for engineering work might well talk of his service to his engineers. The Smart-Turner Machine Co. Ltd., is prepared to render you good co-operation in supplying you with the right pump that will do your work well at low cost.

What you want is the particular pump you need for your class of contracts. Tell us your needs—let us recommend a pump and tell you why.

Now, in the SPRING—think PUMPS.

We have a representative near you. We will be pleased to let you have his name.

The
Smart-Turner Machine Co.
Limited
Hamilton - Canada

A Tar and Asphalt Spraying Service

For Municipalities and Contractors

The scientific application we give by our spraying service.

We undertake the heating, hauling and spraying of light and heavy tars and asphalts used in the "Surface Treatment" of any class of roadway and in the construction of "Bituminous Penetration Macadam."

We supply spraying equipment, assure rapid work properly carried out, 100 per cent from material, minimum inconvenience to traffic, low maintenance on construction work and a lower overall cost than by any other method..

Whether you have one or many tank cars of material to be applied, our service is just as economical. Write us; we will gladly co-operate in your maintenance and construction problems.

Although an extreme illustration, this shows how materials and road surfaces are very often abused by using improper methods.

The Bituminous Spraying and Contracting Co., Ltd.
205 Confederation Life Bldg. Main 6545 Toronto, Ont.

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CONCRETE PIPE

DOMINION

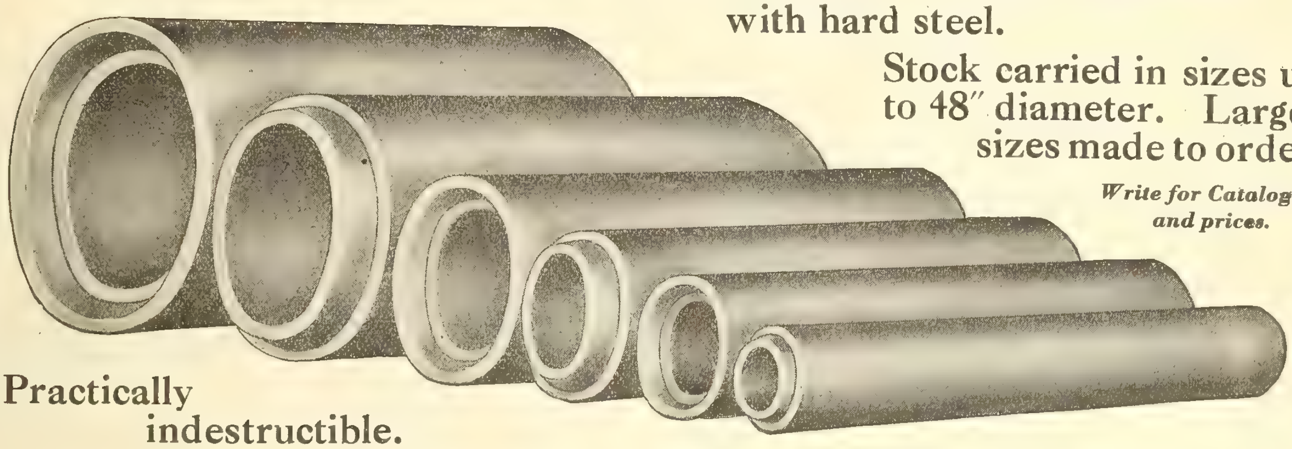
AS you want it **WHEN you want it**

REINFORCED

All sizes over 10″ reinforced with hard steel.

Stock carried in sizes up to 48″ diameter. Larger sizes made to order.

Write for Catalogue and prices.



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DOMINION CONCRETE COMPANY, LIMITED

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"SERVICE STATION"

FOR ENGINEERS & CONTRACTORS

Waterproof Covers
Best Manilla Rope
Select Wire Rope
Yellow and Black Waterproof Clothing
Wire Rope Clips and Thimbles
Galv. Mall., and Wrt. Turnbuckles
Wire and Manilla Rope Blocks

We Ship Promptly

JOHN LECKIE LIMITED

77 Wellington St. West — TORONTO

WRITE FOR CATALOGUE

Current Prices of Building and Engineering Materials

		Toronto	Montreal	Winnipeg	Vancouver
CEMENT (Delivered on job):—					
Retail lots including bags	per bbl.	$4.60	$4.16	$4.80	$3.70
Car lots, including bags	per bbl.	3.60	3.48	4.20	3.35
Refund on bags	each	.20	.20	.20	
LIME (Delivered on job):—					
Lump, in retail lots	per ton	14.30	14.00	.58 bu.	2.70 bbl
Lump, in car lots	per ton	12.70**	11.00	13.80 ton*	2.60 bbl
Hydrated, white in retail lots	per ton	20.00	26.00	.63 bag*	30.00
Hydrated, white in car lots	per ton	19.00	21.00	.56 bag*†	25.00
Hydrated, grey in retail lots	per ton	18.75	17.75		
BRICK and TILE (Delivered on job):—					
Common face brick	per M.	24.00	16.50*	19.00	30.00
No. 1 dry pressed brick	per M.	31.00	30.00	36.00	70.00
No. 2 dry pressed brick	per M.	29.00	25.00	32.00	
Enamelled brick	per M.	125 up to	230.00	185.00	150.00
Wire cut brick, for foundation work	per M.	21.00	19.00		50.00
Sand lime brick	per M	17.00		18.00	
Hollow building tile	per M.			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	60-95	60-75	85-100	80.00
Fire clay	per ton	13-20	15-16.00	35.00**	22.00
STONE, SAND and GRAVEL (f.o.b. cars on siding):—					
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.00 yd.
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 "	" "
Crusher run	per ton	2.20½		3.00 "	" "
Rubble stone	per ton	2.45	1.70	15.00 cord	" "
Gravel, 2 in. screened	per ton	2.05		2.45 yd.	" "
Gravel 1 in. screened	per ton	2.31	1.50	2.75 "	" "
Sand, screened	per ton	1.42½	1.25	1.90 "	" "
Pit run	per ton	1.52¾	1.25	1.90 "	" "
STEEL and IRON (f.o.b. warehouse):—					
Mild steel bars, ¼ in. and heavier	per 100 lbs.	3.75 base	3.50 base	4.60	4.00
Bands 3/16 in. and lighter	per 100 lbs.	4.25 "	3.50 "	5.10 base	
Hoops	per 100 lbs.	5.00 "	4.50 "		
Twisted and deformed bars	per 100 lbs.	3.75 "	3.50 "	4.55	4.00
Angles, channels and tees under 3 in.	per 100 lbs.	3.90 "	3.75 "	5.35	6.00
Structural shapes	per 100 lbs.	3.90 "	3.75 "	5.05 base	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.50 "	3.75 "	5.15	6.25
Plates—3/16 in.	per 100 lbs	4.00 "	4.10 "	5.55	6.50
Plates—10 gauge	per 100 lbs	4.40 "	4.50 "	5.45	6.50
Black sheets—28 gauge	per 100 lbs.	5.50 "	5.00 "	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.90	7.00	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	6.65 "	7.00 "	7.70	8.25-8.50
Rivets	per 100 lbs.	6.25 "	6.00 "	7.00 base	
Cast iron pipe	per ton	65.00	60.00		
VITRIFIED CLAY PRODUCTS (Delivered on job):—					
Sewer pipe, 4 in.	per ft.	.40	.30	.35	.28
Sewer pipe, 6 in	per ft.	.60	.45	.45	.48
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.55
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.70
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.85
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00	.90	.65	.75
Chimney tops	each	9.00	3.50–5.00	7.50	4.50–6.00
Discounts		45 % truck lots 50 % car lots	20 % 50 %	5 %	

CEMENT:—*Discount of 10 cts. per bbl. in 20 days. Price f.o.b. cars is $3.75 †Subject to 5% discount. **Excluding bags.
LIME:—*Discount of 5%. †Bag of 50 lbs. **Price f.o.b. cars is $11.70.
BRICK AND TILE—*f.o.b. plant.
STONE SAND AND GRAVEL:—*Winnipeg prices subject to 5% disco **Toronto prices include sales tax

Construction Equipment For Sale

1—48″ Symons Disc Crusher with spare parts.
2—10 x 16 Four Wheel Standard Gauge Locomotives.
3—40 ton all steel Flat Cars.
11—6 yard All Metal "V" shaped Standard Gauge Cars.
3—24″ x 6′ Austin Screens.
3—American Clay Machinery Co., Vertical Brick Presses.
3—24″ x 36″ S/A Apron Feeders.
3—42″ x 48″ S/A Apron Feeders.
1—Model 70 Bucyrus Steam Shovel.
1—3 ton Brown Hoist 60 cycle Locomotive Crane.

Confederation Equipment Co.
547 Confederation Life Bldg., Main 6544

"Fire Me"

said a progressive salesman to the Manager. "I am costing the House too much. I am spending so much of my time explaining to prospective customers who I am, who my House is, what my goods are, and why they are worth buying, that I don't have much time left for selling. Do all this preliminary work for me by means of effective advertising before I reach the builder, contractor or engineer. It can be done better and cheaper this way than I can ever hope to do it."

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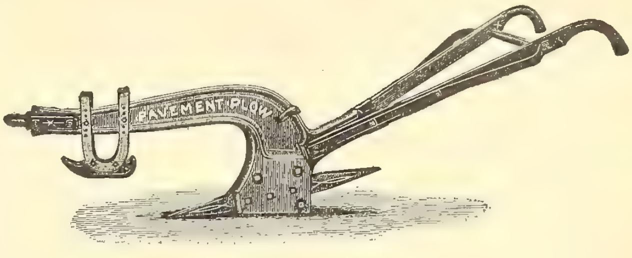
Contract Record and Engineering Review

The wise manufacturer uses the "Contract Record and Engineering Review" not only to save his salesmen time but also to save the time of the Jobbers' salesmen.

The "open door" to the Constructional field is the "Contract Record" which for years has earned and held the confidence of advertiser and buyer.



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Pick and Pavement Plows
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Walking Plows

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Gasoline and Kerosene Engines

Heavy Teaming Gears
Dump Carts
Railroad and Rock Carts
Lorries and Dump Wagons

Massey-Harris Co., Limited

Established 1847

Toronto, Montreal, Moncton, Winnipeg, Brandon. Regina, Saskatoon, Yorkton, Swift Current, Calgary and Edmonton

CURRENT PRICES OF BUILDING AND ENGINEERING MATERIALS—continued

Lumber (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver*
Flooring, 1 x 3 and 4 in., clear, E. G. fir	per M.	[illegible]	60.00	94.50	55.00
Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	[illegible]	65.00	63.00	30.00
Flooring, No. 1 pine	per M.	[illegible]	[illegible]	64.80	
Flooring, No. 1 Spruce	per M.	[illegible]	[illegible]	40.50	
Flooring, birch and maple, 13/16 in. clear	per M.	130.00	110.00	171.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	130.00	125.00	157.50	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	[illegible]	65.00	63.00	30.00
V joint, No. 1 pine	per M.	[illegible]	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	46/61	45.00	67.50	
Red and Jack Pine, 2 x 4 to 12 in., com. rough	**per M.**	48/58	70.00	40.50	
Hemlock, 2 x 4 to 12 in.	per M.	42/45	40.00	42.50	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	40–50.00	50.00	38.70	11.00-13.50
Spruce, 1 and 2 x 4 to 12 in.	per M.	50/60	45-35	38.70	
Timbers, fir, 10 x 10 in. and up	per M.	70.00	58.00	55.00 base	17.-22.00
Lath, No. 1 white pine	per M.	16.00	12.00	12.60	
Lath, M. R. spruce	per M.	10.00	8.50	11.25	7.00
Shingles, XXX B.C. cedar	per M.	6.50	5.00	6.30	3.40
XX B.C. cedar	per M.	4.50	4.25	4.50	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	115.00	55.00
Fir casing	per M.	1¼ ct. per in.	100.00	115.00	

PAINTS, OILS, COLOURS (delivered):—		Toronto	Montreal	Winnipeg	Vancouver*
White lead ground in oil, less than ton lots	per cwt.	15.00	13.75	15.60	15.80
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	22.00
Putty in bulk	per cwt.	5.95	4.25	5.50	9.25
Steel sash putty in bulk	per cwt.	6.45	6.00	8.00	7.75
Boiled linseed oil, in bbls.	per gal.	1.53	1.18	1.26	1.28
Raw linseed oil, in bbls.	per gal.	1.50	1.15	1.23	1.25
Turpentine, in bbls.	per gal.	2.30	2.00	2.50	1.60
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 9/10	6.45 per cwt
Mortar Color, black, in bbls.	per lb.	.08		.06 4/5	.45

PLASTER (Delivered):—		Toronto	Montreal	Winnipeg	Vancouver*
Hard wall plaster, sanded	per ton	13.50	15.00	25.40	30.00
Plaster of paris, in bbl. lots	per bbl.	6.00	5.35	1.60 bag*	7.50
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu.	1.50

LABOR:—		Toronto	Montreal	Winnipeg	Vancouver*
Bricklayers	per hr.	1.00	.80–.90	1.15	1.06¼
Structural Iron Workers	per hr.	.85	.50–.75	1.25	1.00
Plasterers	per hr.	1.00	.80	1.05	1.06¼
Hoisting Engineers	per hr.	.70–.80	.50	.90–1.10	1.00
Plumbers	per hr.	.90	.60–.75	1.00	.90
Carpenters	per hr.	.80	.65	.90	.81¼
Painters	per hr.	.75	.55–.65	.80	.81¼
Electrical Workers	per hr.	.80	.65	.70– .90	1.00
Roofers	per hr.	.65	.65		.90
Laborers	per hr.	.40–.50	.30	47½–.55	.50–.56¼
Sheet Metal Workers	per hr.	.75			.90

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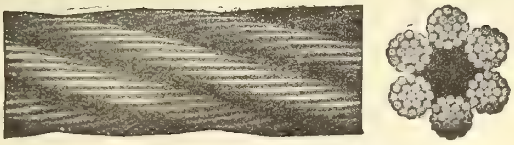

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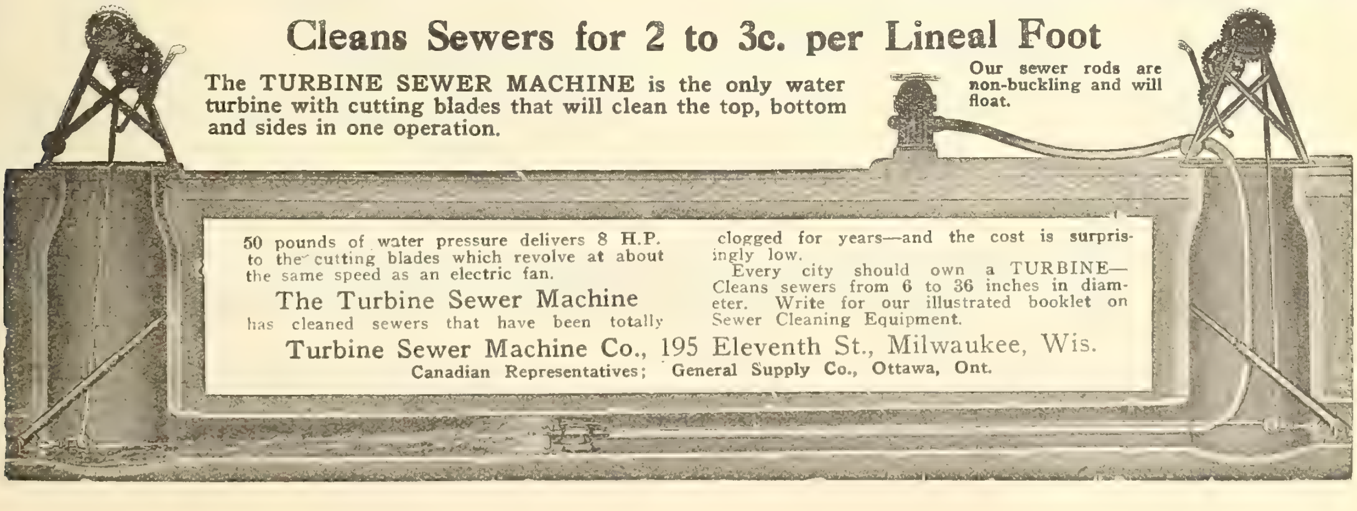

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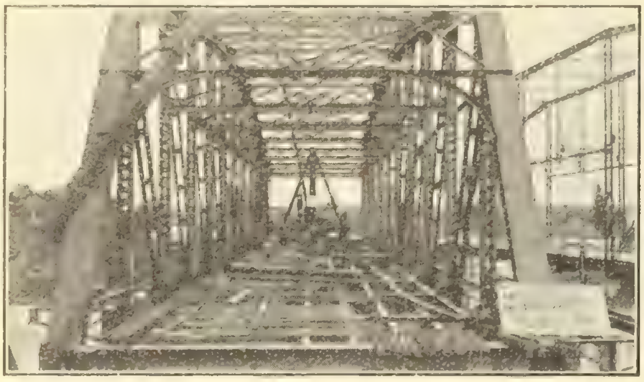

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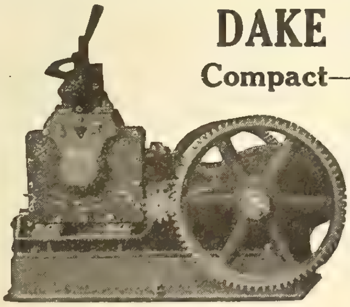

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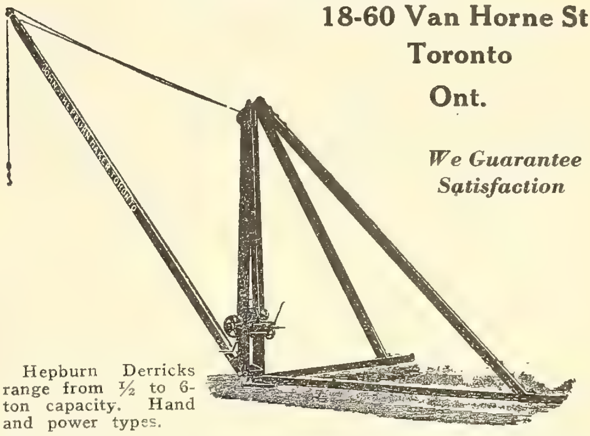

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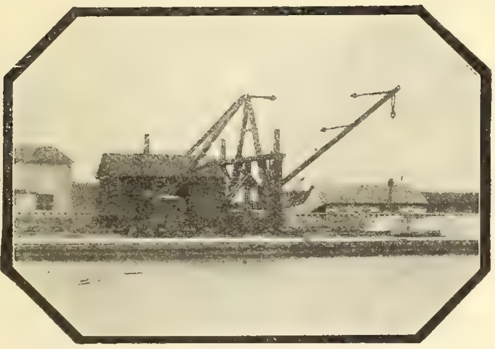

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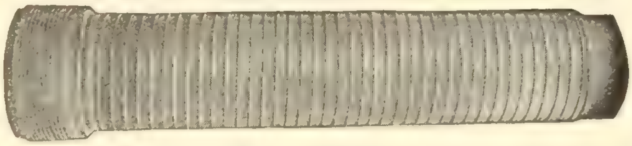

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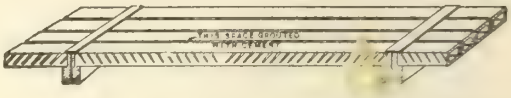

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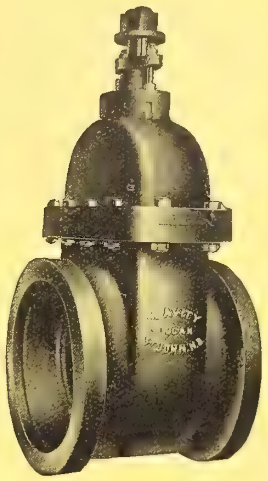

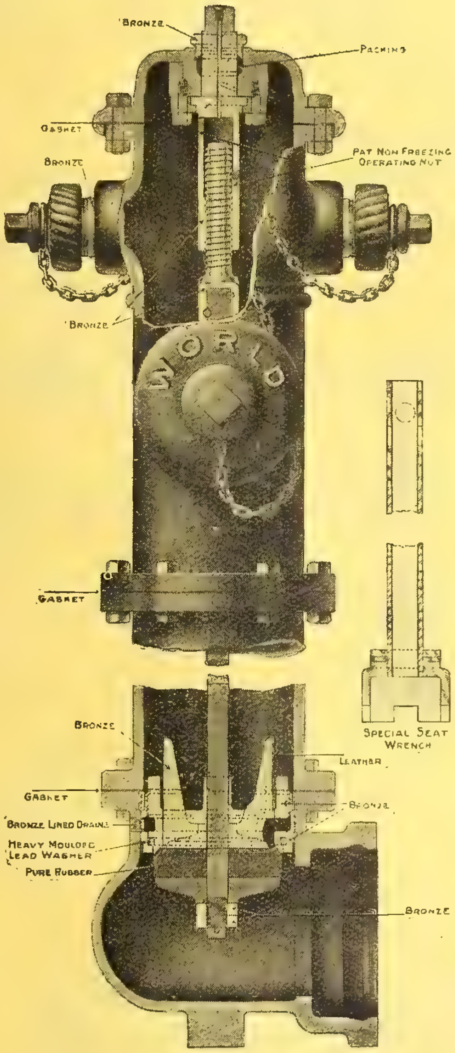

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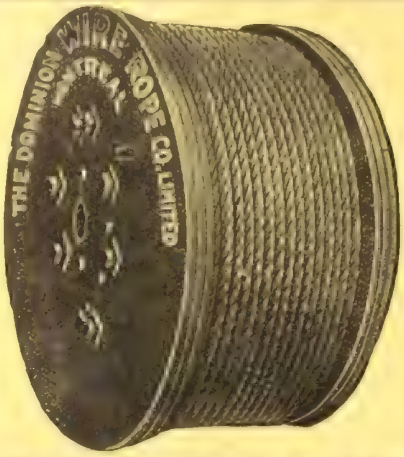

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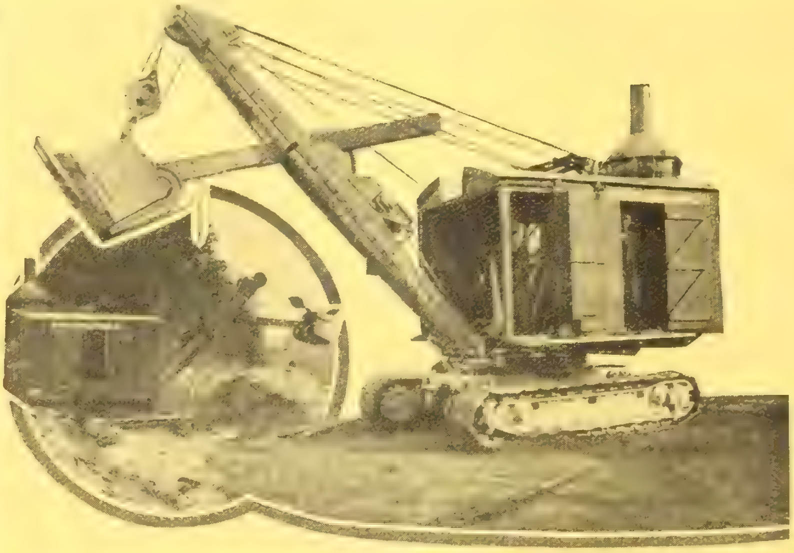

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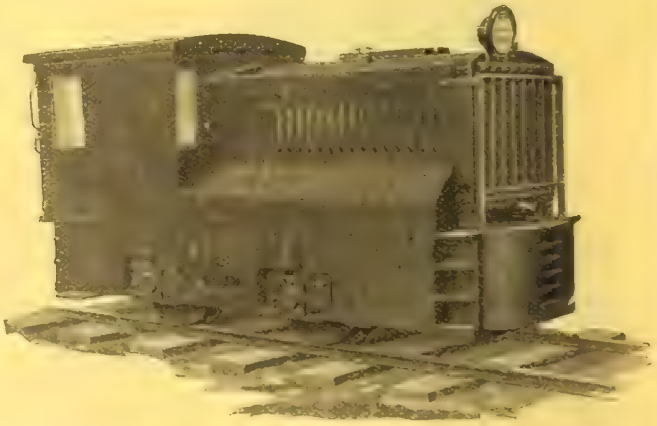

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